THE IRON TRADE REVIEW

Volume LIV Cleveland, May 28, 1914 *No. 22*

Greater Desire to Contract

Displayed by Agricultural Implement Makers—Pig Iron Dull in Most Centers—Coke Ovens Blown Out

Many consumers of finished products are showing increased interest in the market and greater willingness to contract. This is shown particularly in the case of agricultural implement manufacturers who are sounding the market as to steel bar contracts. Buyers of nuts and bolts are also inquiring as to contracts, but manufacturers generally are slow to commit themselves on long contracts at present prices. Whether the agricultural implement makers will obtain price concessions as they usually do, has not been determined, but reports of shading are heard, especially in the Pittsburgh district.

Pig Iron

Some improvement in inquiry is noted in New York and Chicago, but in most centers the pig iron market is still extremely dull. Cast iron pipe makers are figuring on considerable tonnages in the east and the placing of orders of good size at an early date is probable.

Cast Iron Pipe

The low bid on the construction of four cast iron tubes in two tunnels to be built under the East river, at New York, was submitted by two companies acting together, Booth & Flynn, Ltd., Pittsburgh, and the O'Rourke Engineering Construction Co., New York, whose bid was $12,461,000. A number of foundries have been figuring on furnishing the castings to the contractors.

Tin Plate and Sheets

While the tin plate mills are busy, prices are low, and little, if any, business is going at $3.40. Specifications against contracts at lower figures are coming in slowly. A Cleveland company, which caters to the automobile trade, has placed an order for 8,000 tons of sheets with the American Sheet & Tin Plate Co. There is still considerable price irregularity in sheets.

Structural Material

An inquiry for 20,000 tons of structural material sent out by the Brown Hoisting Machinery Co., Cleveland, is enveloped in considerable mystery. No announcement has been made as to how the material is to be used. Inquiries have been sent out for bids for three subway sections in New York, calling for 12,000 tons of steel.

Foreign Trade

Three cargoes of iron ore, aggregating about 20,000 tons, are en route from the Chilean properties of the Bethlehem Steel Co., to Philadelphia. Belgian makers recently have sold 1,000 tons of girder rails for delivery to traction interests, at San Antonio, Texas. An importation of rails from India will arrive on the western coast of United States within the next two weeks. Importations of foreign steel bars to the eastern coast are very light. The United States Steel Corporation has taken orders for 35,000 tons of rails for export to the British Colonies.

Railroad Buying

Officials of leading steel companies express satisfaction in regard to the decision of the Supreme Court in the "tap line" case, reversing the decision of the Interstate Commerce Commission. They believe it will result in fair treatment of industrial railroads and pave the way for a decision in the freight rate case, which will be satisfactory to the railroads and the country generally. This opinion is not universal, however, and in some quarters fear is expressed that the recent decision may complicate matters and delay decision in the freight rate case.

THE OPEN HEARTH

Let the Facts be Known

THE people of the United States are justly proud of the Panama canal. They are proud, not only because the many problems of engineering and sanitation were solved, but also because the tremendous undertaking was carried nearly to completion with entire freedom from charges of dishonesty on the part of government employes or of contractors and their employes. It is indeed deplorable that this clean record is now marred by charges of attempting to defraud the government made against employes of a sub-contractor, the Carbon Steel Co. True it is, that the original newspaper telegrams sent out from Pittsburgh May 21, and widely published, were absolutely false so far as they alleged that it was charged "that the steel furnished was of such inferior quality that the immense locks at the dam in the canal are liable to let go at any time, causing heavy loss of property and probably lives". No such sensational charge was ever made, but if it had been in the indictment, it would not have been sustained. Major Boggs, of the Isthmian Canal Commission offices at Washington, asserts that the attempt to deliver defective steel was discovered by the inspectors and that there is no defective steel in the locks.

In spite, however, of the false reports which have been disseminated, the charges really made are grave and we believe that nobody will be more anxious to have the whole truth known than will men connected with the steel business, who are determined that they will not share any of the disgrace of shielding anyone in the business who has been guilty of attempting to defraud the government. Certainly the proper spirit of co-operation with the government is being shown by the new officers of the Carbon Steel Co.

The exhibit given in Cleveland last week to illustrate the effect of the use of intoxicating liquor in causing accidents and interfering with the efficiency of workmen is typical of the new methods of fighting intemperance. Doubtless with some men, the old. emotional method is effective and we are not disposed to rob the sensational evangelist of any credit that is due him for inducing men to lead sober lives, but in the long run and in the majority of cases, we believe that the unemotional method is preferable. Certain it is that now as never before, workingmen are being shown most impressively that the intemperate man cannot succeed as can the man who abstains.

The Call to Service

THE declination of H. A. Wheeler to serve as a member of the Federal Reserve Board is a matter for sincere regret. Mr. Wheeler is admirably equipped to serve on this important board and it is not easy for the President to find men of the highest ability to assist in inaugurating the new banking act. For men of large affairs to serve on the board means to make sacrifice, but that is what business men must do if the great problems relating to the connection between business and government are to be satisfactorily solved.

It is very common for business men to complain that public officials have neither the experience nor natural ability properly to discharge their duties. Even the Interstate Commerce Commission members have been branded as men not big enough for their jobs. At a recent meeting of important business men of a large city in the central west, the plan to establish a trade commission was under discussion. Some severe criticisms were made concerning the personnel of public officials. Thereupon, one of the critics was asked the blunt question whether he would accept a position on the trade commission at the proposed salary and the frank reply was that he would not. One business man then expressed the opinion that there was not a man in the meeting who would accept the position. In other words, there was not a man who would make the personal sacrifice necessarily involved in the acceptance of the position. There is but one alternative, unless salaries of public officials, particularly those connected with commissions, are raised. Sacrifice of business and personal interests on the part of those called to enter the public service and thereby serve their country will be imperative.

Views on the Business Outlook

Gleaned at the Meeting of the American Iron and Steel Institute

E. H. GARY, Steel Corporation.

"We are going to have an abundant crop this year and it will have its influence on business conditions. Crops are something that cannot be taken away from us, even by the politicians. We shall see improvement. This country is just as big as it ever was; it is growing just as fast. It is rich and it is bound to be prosperous."

WILLIS L. KING, Jones & Laughlin Steel Co.

"I feel indications are for an improvement in demand and I believe in prices, in the not-distant future."

JAS. A. FARRELL, Steel Corporation.

"In my opinion, based upon a careful survey of the situation, an improvement in trade conditions, both as to tonnage and values, is not far off."

LEONARD H. PECKITT, Empire Steel & Iron Co.

"Business will go along about as now, in my opinion, until around August, when the first signs of real improvement should appear. Everything indicates this. The railroads will be properly treated and business then will go along as it should go."

EDGAR C. FELTON, Pennsylvania Steel Co.

"Were it not for the threat of importations, we would have pretty good business this fall, I think. Congress then would be adjourned, the freight rate case settled and good crops assured, and that should stimulate business."

A. F. HUSTON, Lukens Iron & Steel Co.

"I believe by midsummer, we will have better conditions. Judging the future by the past, there must be some change soon."

F. S. WITHERBEE, Witherbee, Sherman & Co.

"Good crops, the adjournment of congress and a satisfactory settlement of the railroad rate case, ought to bring considerable improvement by Sept. 1."

JOS. G. BUTLER, JR.

"We are getting nearer every day to an era of prosperity, I think. We now are five months nearer than Jan. 1. A favorable result of the elections this fall will count for much in a business way."

JOHN A. TOPPING, Republic Iron & Steel Co.

"The situation is very much mixed. We all feel that conditions are about as bad as they can be, but are afraid the change for the better will be slow. I do not see much ground for the expectation of a rapid change."

JAS. A. CAMPBELL, Youngstown Sheet & Tube Co.

"We are going to have better business, but not much better prices in the near future, in my opinion. The bottom has been reached and some price advances must come, as some lines of steel are selling below cost. I am not certain that a change for the better has not already set in."

M. C. ARMOUR, Rogers, Brown & Co.

"Within sixty or ninety days, I look for a considerable improvement. There now are a good many indications of a change for the better. Inquiries for iron are more numerous and aggregate a considerable tonnage."

SEVERN P. KER, Sharon Steel Hoop Co.

"I believe things are at the bottom and any change will be in the direction of improvement. This change, I think, however, will be considerably delayed."

Prices Present and Past

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producing interests say this situation usually precedes the development of actual buying and will continue until the market is again established. There is a disposition on the part of the furnace men to waive grade differences to some extent on favorable tonnages and deliveries in order to secure the business.

Melters in the Buffalo district are not feeling any appreciable improvement in demand for their products, in fact the general situation with them is one of dullness and a dropping off in consumption. Some of the foundries, owing to the depression of business, are compelled to curtail forces to a greater extent, keeping operations down until there is a release of the business being held back.

Foundry Weaker at Pittsburgh

The Standard Sanitary Mfg. Co., Pittsburgh, has closed for 1,000 tons of No. 2 foundry for June and July shipment to plants at Allegheny and New Brighton, Pa., at $13.90, delivered, or 25 cents a ton less than the previous minimum quotation for this grade. Some valley interests continue to ask $13.50, valley, for both No. 2 foundry and malleable grades, but it is apparent the former can be laid down in Pittsburgh at considerably less. The American Steel Foundries have not yet closed for 10,000 tons of basic for shipment to plants at Sharon, Pa., and Alliance, O., being unable to obtain iron at less than the current price. For the first time in several months, a few of the heaviest melters have displayed interest in the future market, but actual sales show no improvement and prices, too, have not strengthened.

The interest caused by the increased activity in basic has subsided in the Cleveland district and the dullness of earlier weeks again prevails. One company which has quoted $13.25, valley, on No. 2 foundry has made moderate sales; while the companies asking $13.50, valley, are doing practically no business. Two purchases of 8 per cent silicon, 300 tons each, were made at $16, Jackson, and the market seems to have considerable firmness at that figure.

Inquiry Better at Chicago

Considerable increase of inquiry for foundry grades of pig iron has been experienced recently, although of rather a listless sort. Buyers apparently are seeking to ascertain what prices can be made, but are not anxious to close contracts for third quarter or last half. However, some tonnage is being placed on the books for third quarter and a less quantity for the full half. Furnaces in this district are repeating the tactics pursued since the buying movement in January, quoting No. 2 foundry and malleable at $14.25, Chicago furnace, for third quarter, but asking $14.75 for full last half or for fourth quarter.

The idea still obtains that a heavier demand is coming and pig iron makers are holding whatever advantage they can by discouraging contracts more than three months in advance. With considerable tonnage on the books in the shape of orders deferred from first half, furnaces promise to enter third quarter with shipments and output fairly well balanced on a basis of 50 per cent operations. Some interests here find shipments considerably larger than output and such stocks as have been accumulated are being drawn upon.

Some makers of southern iron claim nothing is being done at higher than $10.50, Birmingham, for No. 2 foundry, while others contend sales are being made at $10.75, Birmingham, for last half delivery.

Uneasy at Cincinnati

A feeling of unrest is very evident in the Cincinnati market. It is known that buying has been a little better during the past week, but transactions have been of such a secret nature that the market in general has not received any definite information about them. The Portsmouth Steel Co., Portsmouth, is about to close for 10,000 tons of basic. Prices have been submitted on this business and various furnaces of southern Ohio are waiting to see how it will be distributed. A sale of 1,400 tons of southern foundry iron has been made to an Indiana consumer for last half shipment and a northern Indiana melter in Toledo territory is still in the market for 2,000 tons of northern foundry iron.

As far as open quotations are concerned, southern prices are unchanged at from $10.50 to $11, Birmingham basis, for No. 2 foundry, including both Alabama and Tennessee makes for delivery from the present time through the second half. It is expected, however, that when some of the secret transactions that are being made today became known, lower prices will have been made to induce buying. Southern Ohio furnaces are holding at $13.50, Ironton, for No. 2 foundry, for the first half.

Buys More Basic

The Commonwealth Steel Co., of St. Louis, bought 3,000 tons additional northern basic iron in Chicago the latter part of last week. This is about the extent of pig iron buying in St. Louis, with the exception of a few car lots for quick shipment. At St. Louis, southern No. 2 is quoted from $10.50 to $11, Birmingham basis. Prices of northern iron are unchanged.

(*For complete prices see page* 984)

Chilean Ore

Coming From Properties of Bethlehem Steel Co.

Three cargoes of iron ore, aggregating approximately 20,000 tons, from the Chilean properties of the Bethlehem Steel Co., now are en route from Cruz Grande to Philadelphia. These will be the first cargo lots of Chilean ore ever brought into this country. The shipment is being made by way of the Panama canal and the freight rate fixed at wild charter is 15s 6d. This rate, applying only to the particular shipment, is 3s higher than the figure at which the Bethlehem Steel Co. recently closed with Swedish steamship interests on a contract covering transportation of ore between Chile and the United States for a term of years. The third cargo of the season of Wabana, Newfoundland, ore, amounting to about 7,000 tons, also is en route to Philadelphia. This shipment still represents delivery against orders carried over from last year. The east is practically bare of ore sales, either domestic or foreign, though some negotiations continue.

The Lake Superior iron ore market drags and very few sales were made during the past week. Regular prices are being adhered to except in the case of low grade ores.

Little Activity in Alloys

Buying of ferro-manganese in eastern districts remains very limited. Carloads are the usual transactions. Several buyers who are not well covered ahead, are holding off from closing in the belief that there is nothing to be gained by acting at this time. Prices are unchanged at $38, seaboard. Other alloys are quiet.

Pittsburgh Alloys Quiet

The alloy market at Pittsburgh shows no change in position. Some inquiry for small lots is reported, but there is no snap to buying. Quotations are unchanged.

Buyers Would Like to Contract

In the Cleveland district, manufacturers of nuts and bolts report the increased disposition of buyers to contract, but the manufacturers are not willing to do so at present low prices.

Nut and Rivet Plants Not Active

Manufacturers of nuts, bolts and rivets in the Pittsburgh district are not operating plants at much more than 50 per cent capacity. Specifications are coming out slowly, and prices are irregular and uncertain. Prevailing rivet quotations are being shaded when attractive tonnages are involved.

Sheets in Better Demand

Large Order Placed by a Cleveland Concern —Still Cutting Prices

Some large buyers of sheets are showing a desire to contract as soon as possible. A large Cleveland consumer which caters to the automobile trade has closed for 8,000 tons of sheets with the American Sheet & Tin Plate Co. Considerable other business is pending.

Better Specifications

One large manufacturer of sheets in the Cincinnati district reports better specifications during the past week with new orders holding their own. Other mills, however, report, a very dull business with specifications low and new contracts at a minimum. Prices in surrounding territories are lower than those in the Cincinnati district. Black sheets No. 28 gage are quoted at from 1.90c to 2c, galvanized No. 28 at from 2.85c to 2.95c, and black annealed No. 10 at 1.55c, all Cincinnati basis.

Sheets Still Weak at Chicago

Sheets fail to feel the general uplift in finished steel in the Chicago market and apparently are the weakest product. Although quotations remain at 1.98c to 2.03c and 2.98c to 3.03c, Chicago, on No. 28 gage black and galvanized, respectively, considerable tonnage appears to be moving at $1 per ton less than these minimums. This is more easily obtained on galvanized than upon black sheets, in view of the low price of spelter.

Sheets Still Low at Pittsburgh

Although consumers are showing more interest in future requirements, there is no actual change in the market for steel sheets in western Pennsylvania and eastern Ohio. Several prominent buyers have opened quiet negotiations for fairly heavy tonnages, but mill managers have refused to sell for deliveries desired at prevailing prices. No. 28 gage galvanized sheets are quotable at 2.80c; No. 28 gage black at 1.85c, with some tonnage going at 1.80c, and No. 10 blue annealed products at 1.35c. Mill operations are unchanged.

East Stands Against Shading

A firm stand against shading a minimum of 1.50c, Philadelphia, or 1.35c, Pittsburgh, on No. 10 gage blue annealed, is being taken by eastern Pennsylvania sheet makers. Buyers unsuccessfully have been trying to develop $1 lower. Small orders are being taken at 1.55c, Philadelphia, or 1.40c, Pittsburgh. The eastern market remains narrow, as immediate requirements only are being covered largely. Better buying for the last half is expected soon. Operations in the east are lighter, the Alan Wood Iron & Steel Co. having taken off two mills. Eastern makers recently figured on large inquiries for heavy sheets from automobile manufacturers in Ohio.

Semi-Finished Dull

There is no life to the market for semi-finished products at Pittsburgh or in the valleys. Attempts to obtain billets at less than $20, mill, have been unsuccessful, but no trace of sales at any figure can be found. Sheet bars are held at $21, mill. Wire rods are quiet; they are listed at $26, Pittsburgh.

Plant Closed at Ashland

The Ashland Steel Co., Ashland, Ky., has closed its plant temporarily because of quiet conditions and lack of orders. Activities will be resumed about June 1. As a consequence wire rods and billets are unchanged in prices at $26.50, Ashland, for the former and $20.50, Ashland, for the latter.

No Eastern Billet Business

Practically no inquiry or new business of consequence in billets is coming out in the eastern Pennsylvania market. Leading makers report new bookings in May have been practically nominal. Specifications against running contracts are keeping the mills in operation. For rolling steel, $22.40, Philadelphia, or $20, Pittsburgh, seems minimum. Forging billets are $4 to $5 higher.

More Ovens Blown Out

In Spite of Reduced Production, Prices Are Very Irregular

Coke ovens were blown out in wholesale lots last week, the *Connellsville Courier* reporting that operations were discontinued at more than 3,000 ovens. Indications are that output will be further reduced. Despite curtailment, prices appear to be weakening. Some of the more prominent operators continue to ask $2, ovens, for contract furnace coke, but it is understood some grades are being offered at as low as $1.75, ovens, for any delivery. Some standard fuel for spot shipment has been sold at that figure, and several consumers claim they can obtain coke of good quality at $1.75, ovens, for extended shipment. The *Courier*, for the week ending May 16, says production was 294,715 tons, a decrease of 17,385 tons, compared with the week before.

Sale at St. Louis

One local sales agent at St. Louis reports a sale of 2,000 tons of foundry coke to an Illinois concern last week. The inquiries for 30,000 tons and 10,000 tons of coke reported last week have not been closed nor withdrawn. Prices of Connellsville and Virginia grades are unchanged.

Pocahontas Coke Weaker

The coke market at Cincinnati is chiefly characterized by the request to withhold shipments. Sales during the past week have been very few and for small tonnages. Prices are unchanged in the Wise county and New River districts, but Pocahontas foundry coke is a little weaker at from $2.40 to $2.50, ovens. Furnace coke from that district can be had at from $1.90 to $2.40, ovens.

Eastern Furnaces Buying Coke

Another eastern consumer has closed on slightly less than 10,000 tons of prompt furnace coke at $1.80, Connellsville ovens. This purchase brings the total sales of prompt furnace coke to eastern Pennsylvania, New Jersey and Buffalo furnaces, within the past several weeks, to 40,000 to 50,000 tons, some of which has been reported previously. The prices ruling on most of this business was $1.75 to $1.80, ovens.

Tin Mills Busy

Tin plate mills, with few exceptions, continue to operate at practically maximum capacity, on contracts taken earlier in the season. Some new business is reported, and material is going at $3.30 for base size tins when desirable lots are involved, and some makers have shaded that figure.

Edgar S. Cook, president of the Warwick Iron Co., Pottstown, Pa., has returned from a foreign tour.

(*For complete prices see page* 984)

Implement Men Inquire

But Mills Are Slow About Making Contracts at Present Prices

Implement manufacturers in eastern Pennsylvania have made further moves to sound out the steel bar market and several of them now are figuring tentatively on half or full year contracts from July 1, calling for estimated requirements of 4,000 to 5,000 tons. Bar makers are slow to commit themselves on prices so far ahead owing to the present low stage. One of them, however, has been talking $1 advance for third quarter. There is not much new business in plain bars moving in eastern Pennsylvania and surrounding markets, but the demand for reinforcing bars is very fair. Bids went in this week on a small tonnage and will be taken May 27 on 800 tons of twisted bars, both for the Panama canal. A recent inquiry from Baltimore jobbers for 3,100 tons of twisted bars is believed to be for a large Coca-Cola warehouse in that city. Further cases this week are noted where makers refused offers of 1.10c, Pittsburgh, or 1.25c, Philadelphia, and the market seems firm at 1.30c, Philadelphia.

Few Foreign Bars in East

Steel merchants who have kept a close watch upon the records of the ports of New York and Philadelphia in recent months, state that practically no foreign steel bars have come in at these points. As previously reported, however, a fair tonnage of German bars recently was received by Boston jobbers. Some good-sized requirements for reinforcing bars are pending in the metropolitan district, but new business, on the whole, is light. Prices continue 1.31c, New York, or 1.15c, Pittsburgh.

Steel Bars Weaken at Pittsburgh

With the beginning of light buying at Pittsburgh, the steel bar market has manifested signs of slight weakness. Leading mills are asking 1.15c, but it is reported consumers have been offered material at 1.12½c, or 50 cents a ton less than the general asking price, but such reports have not been fully verified. Compared with the market for steel plates, that for steel bars is slightly stronger. No particularly heavy buying has taken place.

The market for iron bars in the Pittsburgh district continues quiet, and the prevailing price is nominal. Local mills are asking 1.30c and 1.35c, but tonnage can be laid down there at $1 and $2 a ton less than minimum market quotation.

Steel Bars Move Better

A number of producers of steel bars in Chicago have felt largely increased interest on the part of buyers and inquiries, orders and specifications the past week have been much heavier than for several weeks past, in fact, practically double the total of the preceding week. As yet, the volume of business is not sufficient to call for an increase in production nor is it sufficient to affect quotations. Prices remain 1.28c to 1.33c, Chicago.

Bars No Stronger

The market for iron bars in Chicago continues to be moving fairly well, and while specifications are somewhat better than has been the case and inquiries and orders are somewhat improved, deals are almost entirely in small tonnages and for immediate delivery. Apparently users are buying only for the more pressing needs and are not willing to take more than they can consume within a short time. Mills are operating almost entirely on current business, as tonnage on mill books is practically exhausted. Expectations that rolling operations would be curtailed shortly have not yet been realized, as sufficient business has been coming in from week to week to maintain rolling schedules. We quote iron bars 1.10c to 1.12½c, Chicago.

In the Cleveland district a number of manufacturers of agricultural implements have come into the market to see what could be done, but no contracts have been made. In that district 1.15c, Pittsburgh, seems to be the minimum quotation.

Specifications in the Buffalo district have shown an improvement over the first two weeks of the present month. Fair tonnages are being booked by mills and agencies. The ruling price is 1.15c, base. So far, nothing better has appeared, despite rumors that 1.12c and 1.10c, base, have been obtainable.

Lower Reports at Philadelphia

The eastern trade hears reports that 1.15c, Philadelphia has been done on common bar iron, but these statements are not fully verified. The inside price heretofore has been about 1.20c, Philadelphia, and that upon the desirable orders. New business among eastern Pennsylvania mills remains small and some of these plants are running on only day-to-day orders.

The plant of the Jansen Steel & Iron Co., Columbia, Pa., manufacturer of bar iron, was closed down this week on account of the poor trade conditions.

Hoops, Bands and Shafting Quiet

The market for hoops, bands and cold rolled shafting at Pittsburgh continues dull and prices are regarded as nominal. Shafting is selling as low as 66 per cent off list. Hoops are named at 1.25c and bands at 1.15c.

Prices Shaded

On Oil Country Goods—Philadelphia Co. Inquiry

Reports of new cards on oil country goods having been issued were heard in the trade early this week, but no trace of any change in published quotations can be found. It is understood, however, that discounts for oil country goods have showed irregularity in some sections. The Philadelphia Co. has entered the market for 12,000 feet of 10¾ inch O. D. plain end steel pipe for a gas line, equivalent to about 220 tons. Standard iron and steel pipe discounts are unchanged. Demand for boiler tubes is light, and prices irregular.

Wire Prices Shaded

Despite moderate improvement in specifications from the west, wire products show price weakness in the Pittsburgh district. The $1.60 price for nails is nominal; material is selling at $1 and even $2 a ton under that figure. Consumers still refuse to buy for anything but prompt delivery.

Chicago Warehouses Busy

Warehouse business continues to hold up well in Chicago, and no diminution in demand has been noted. With building operations more or less interfered with by strikes, warehousemen have found their business somewhat curtailed for the season, but in spite of this, business is increasing week by week. Quotations on shapes, plates and bars from store remain at the same level as has been prevailing, but No. 28 black and galvanized sheets have been reduced from 2.55c and 3.55c to 2.45c to 3.45c, Chicago, to meet lower quotations by sheet mills.

The Capewell Horse Nail Co., Hartford, Conn., has let the contract for a new steel storage building.

(*For complete prices see page* 984)

Bids on Cast Iron Tubes

Received in New York—Lowest Tender is Over Twelve Million Dollars

The low bid for constructing four cast iron tubes in two tunnels under the East river, between lower Manhattan and Brooklyn, has been submitted by Booth & Flynn, Ltd., of Pittsburgh, and the O'Rourke Engineering Construction Co., of New York, bidding in partnership. Their tender was $12,461,000. These tubes, as previously reported, will require about 80,000 tons of cast iron segments, and a number of foundry companies have been figuring with contractors to furnish this material. R. D. Wood & Co. are low bidders on 2,500 tons of 30-inch pipe for Perth Amboy, N. J. There is a fair run of small pipe orders in the list, but the large lots are lacking. Prices remain soft.

Cast iron pipe in the Chicago district appears to be somewhat more active than has been the case for several weeks. Contractors are taking small lots more liberally than before and this tonnage amounts to a respectable total, which is entirely satisfactory to foundries. The United States Cast Iron Pipe & Foundry Co. has been awarded 1,000 tons at St. Louis, part of which is in larger sizes so much desired by foundries. Transcona, Man., will let contracts for 1,470 tons May 30, and Sioux City, Ia., will let 200 tons at the same time. Bids on 750 tons of pipe for high pressure have just been opened at Cincinnati and it will be awarded shortly.

Plate Mills

Operating at About Half Capacity in East

The plate mills of eastern Pennsylvania now are running at about 50 to 60 per cent of capacity, and new business, made up chiefly of small lots, is around that basis. The run of the market still brings 1.30c, Philadelphia, or 1.15c Pittsburgh, but desirable orders are shading this about $1. The Alan Wood Iron & Steel Co. recently took a tonnage of plates for New York elevated work from the McClintic-Marshall Co. The Seaboard Air Line is inquiring for the tank steel for 25 locomotives and the Chesapeake & Ohio has offered some small lots.

Small Orders at New York

Some good-sized plate requirements continue to be presented by elevated and subway work in New York City and these have been going to producers both in the east and the west. Other than these tonnages, the metropolitan plate market consists of small odds and ends. The full range of prices remains 1.26c to 1.31c, New York.

Plates Low at Pittsburgh

Manufacturers of heavy steel products in the Pittsburgh district returned from the American Iron and Steel Institute meeting at New York more hopeful that the long looked for change in market conditions soon would come. Inquiry for steel plates is somewhat better, but material continues to go at 1.10c, and actual orders are no better.

Plates Remain Weak

Of the finished steel products, plates appear to have been affected least in the Chicago market by the present movement, and in the absence of increased car building less change is noticed than in other steel products. Steel plates are still quotable in this market at 1.28c to 1.33c, Chicago.

Scrap Buyers

Show More Interest in Some Centers, But Dullness General

Some consumers in eastern Pennsylvania are showing more interest in their scrap needs and the tone of the market continues a little better, but the volume of trade still lags. No further sales of heavy steel have resulted. Two consumers of wrought pipe have been in the market and have taken some lots at $10.75 and $11, delivered, with some reports that lower was done. The heavy cast market has a wide range of from $12 to $13, delivered, depending upon individual conditions. Car wheels and No. 1 forge are lower.

Dull Market at Metropolis

The scrap market at New York City and vicinity remains listless. Only small orders are being placed by consumers and buying by brokers against old contracts is the principal activity. Prices continue to weaken and foundry materials are lower this week. Wrought scrap is very dull, due to poor business conditions among the iron mills. One of the Columbia, Pa., plants has shut down.

There is a tendency towards a better demand in the Buffalo old material market, otherwise conditions remain about the same as reported a week ago.

Pittsburgh Scrap in Dumps

The old materials market in the Pittsburgh district, in the dumps for several months, shows no actual signs of improvement. Melters are refusing to pay $12 for heavy melting steel, but some dealers continue to regard $12.50 as the market price for this grade. Demand for other grades of scrap is decidedly light, and quotations continue to reflect weakness.

Very Unfavorable Conditions

At Cleveland, dearth of transactions has resulted in a largely nominal level for scrap quotations. All rolling mills are refusing shipments of old material; foundry trade is exceedingly light and supplies of cast scrap are large. One of the main users of melting scrap is accepting but one or two cars of steel a week from each dealer. Taking all in all, about the same situation prevails as in November, except that now there are few signs of better times in the near future, while in November there were plenty of indications of a nearby buying movement. Despite the obvious curtailment of scrap supplies through decreased mill operations, railroad and country offerings are swelling stocks in yards.

Dull at Cincinnati

Demand for old material in the Cincinnati market remains at a minimum. Users in that territory have sufficient supplies to run them for a long time or else are buying in small lots only to fill requirements from week to week. Conditions are essentially in the hands of buyers, as separate quotations are made on each transaction, regardless of a general level of prices. Machine shop turnings picked up a little during the past week and were selling at from $4.50 to $4.75 per net ton. This was only a temporary spurt, however, as this material today shows signs of becoming inactive again.

Chicago Scrap Stationary

In an almost entire absence of demand for scrap in the Chicago market, prices remain nominally the same as a week ago. It is entirely a buyers' market and prices are whatever a buyer and seller can agree on, regardless of quotations. Brokers have almost ceased dealing among themselves and consumers are taking practically nothing, leaving the market in an absolutely negative position.

Railroad offerings continue to be made liberally and at present almost 20,000 tons are before the market. The Baltimore & Ohio is offering 12,-

(*For complete prices see page* 984)

000 tons of which 3,000 tons are long steel rails; the Rock Island offers 4,000 tons, of which 600 tons are long steel rails; the Grand Trunk, 1,900 tons; the Illinois Central, 300 tons; the Monon, 600 tons; the Mather Stock Car Co., 100 tons, and the Standard Oil Co., 870 tons.

At St. Louis, the steel mills are asking for steel scrap to some little extent, but all other lines are dull. Dealers believe the bottom has been reached in prices, however, and that it will be a waiting game for some time. Railroad lists are out today as follows: Illinois Central, 3,500 tons; Frisco, 2,000 tons; M., K. & T., 300 tons, all of which will be closed this week.

Inquiry for Structurals

In Cleveland District is for 20,000 Tons, Sent Out by Brown Hoisting Machinery Co.

The largest inquiry which has been pending in the Cleveland district for a long time has been sent out by the Brown Hoisting Machinery Co., for 20,000 tons of structural material. The company states that it is unable to give any particulars concerning this business. The fire in the flats, Cleveland, Monday night, caused a loss of over a million dollars and resulted in serious damage to the Central Viaduct, the Nickel Plate bridge, the Big Four bridge and burned about 40 cars belonging to Ringling Bros. circus. No estimate has been made as to the amount of steel which will be required to repair the damaged bridges.

The lowest bidder on the general contract for the new barn of the Cleveland Railway Co., calling for 1,600 tons of steel, was Roderick D. Grant.

Better Lettings in West

Considerable increase has been noted in the number and tonnage of structural lettings in the Chicago district the past week, a total of over 7,000 tons having been closed. The far west and south, as has been the case largely the present spring, have taken the greater portion of this and only a small tonnage goes to railroads, the greater portion being for industrial and business structures.

Shape Market More Active

The undercurrent of improved sentiment which has been felt in the Chicago district for a fortnight has resulted in enlarged business in steel structural shapes and makers have experienced an increase in business which has been most gratifying except for the fact that they fear it may not prove lasting. Specifications for immediate delivery have increased materially and there is a much greater inquiry than has been felt for several weeks past. Shapes still are obtainable at 1.28c to 1.33c, Chicago.

Pittsburgh manufacturers of structural shapes report that inquiry is somewhat better, but prices show no improvement. Shapes are being held at 1.15c, but in adjacent districts material is going at 1.10c, and reports of the general asking price being shaded for delivery in the Pittsburgh territory are heard. Structural undertakings throughout the country have helped to improve the situation to some extent.

At Buffalo, no orders for large tonnages of structural material have appeared as yet to really test the market, but the prevailing price seems set for the present at 1.15c, base. There has been an improvement in specifications and inquiry for moderate tonnages.

Small Orders at Philadelphia

Structural shape tonnage from the Philadelphia and surrounding districts has dropped to only small current orders at present. Sizeable lots are rare but the mills are getting fair specifications against recent bookings. On the present small offerings, 1.30c, Philadelphia, or 1.15c, Pittsburgh, prevails. Larger sized orders undoubtedly would be done at $1 less. Some new bridge work for eastern Pennsylvania delivery is out.

More Subway Work Offered

Inquiries for three additional sections of New York subway extensions have been issued for bids and these will call for approximately 12,000 tons of steel work. Fabricated orders in the metropolis and vicinity, have been very light, the past week, and the pending tonnage, apart from the subway work, is not heavy. New inquiries from New York City are especially few and the architects and engineers are reported to have not much work on their boards. Plain material prices rule from 1.26c to 1.31c, New York, and are determined by the attractiveness of the individual order.

STEEL CONTRACTS AWARDED.

Meier & Frank building, Portland, Ore., 3,500 tons, to the Northwest Steel Co., Portland, Ore.

W. L. DeWolf & Co., Chicago, building, Aberdeen and West Adams street, Chicago, 827 tons, to the Gage Structural Steel Co., Chicago.

The Texas Co. building, Houston, Tex., 1,433 tons, to the Houston Structural Steel Co.

Chicago, Milwaukee & St. Paul Ry. Co., C 3 and C 4 girders, 478 tons, to the Wisconsin Bridge & Iron Co.

Pantages Theater building, Seattle, Wash., 292 tons, to Jos. T. Ryerson & Sons.

Gordon Creek viaduct extension, Utah Railway Co., Helper, Utah, 255 tons, to American Bridge Co.

Bridge work for Western Maryland railroad, 1,000 tons, awarded the American Bridge Co.

Addition to Seneca Iron & Steel Co.'s plant, Buffalo, awarded to Lackawanna Steel Co., 400 tons.

STEEL CONTRACTS PENDING.

Seven span, riveted truss bridge across Schuylkill river at Earnest, Pa., for Pennsylvania railroad, about 1,000 tons; bids being taken.

Richardson department store building, Atlanta, Ga., 1,200 tons; bids taken.

Model Theater, Buffalo, Martin Miller, architect, bids go in in week, 100 tons structural.

Seneca street viaduct, Buffalo, Grade Crossing Commission Work, strengthening floor, Stroebel Steel Construction Co., Chicago, low bidder, 400 to 500 tons structural.

Steel work for Y. M. C. A. building, Brooklyn, 3,000 to 4,000 tons. Bids being taken by the general contractor, The Whitman Co., New York; Bethlehem sections specified.

St. Mary's hospital, Hoboken, N. J., 500 tons, bids taken.

Store and office building for Texas Co., Huston, Texas, 500 to 1,000 tons. Steel bids asked for June 1.

High school, Montclair, N. J., tonnage not estimated. Bids being taken.

Section No. 7 of the Seventh avenue subway line, estimated about 10,000 tons, bids to be taken June 12.

Section No. 1 of the Eastern Parkway subway, Brooklyn, steel tonnage estimated at about 7,500 tons. Bids to be taken June 16.

Connecting loop for subway extensions at Forty-second street, New York City, 450 tons. General contract awarded to the Holbrook, Cabot & Rollins Corporation.

Tubes under East river for New York subway extensions, 2,570 tons of steel and 80,000 tons of cast iron segments. Booth & Flynn, Ltd., and the O'Rourke Engineering Construction Co., low bidders.

The Public Service Commission has awarded to the United States Realty & Improvement Co. the contract for the construction of section No. 2 of the Broadway-Fourth avenue line, to require 5,020 tons of structural steel.

(*For complete prices see page* 984)

Coke Rate Stands

Washington, May 27. (By wire.)—The Interstate Commerce Commission, in an opinion announced this morning, dismisses the complaint of the Wickwire Steel Co. and other Buffalo district furnace interests against the coke rate, $1.85 per ton from Connellsville to Buffalo. The case was once before decided. The Commission's holding that the rate was not unreasonable was reopened when the complainants alleged errors in the original decision. The Commission says since no new evidence has been offered, there is no reason to depart from the first decision.

Heavy Car Steel Orders

Placed With the Carnegie Steel Co.—Rails for Export Booked by Steel Corporation

Car material orders, totaling about 50,000 tons, and covering recent contracts taken by builders, have been placed with the Carnegie Steel Co. by the Pressed Steel Car Co. and the Standard Steel Car Co., within the past few days. The opinion now is expressed in the equipment market that the Supreme Court decision in upsetting the Interstate Commerce Commission's ruling on "tap line" railroads, has cleared the air for the settlement of the freight advance case. As the Commerce Commission had considered the cutting off of freight allowances made by through lines to industrial lines, as a means of providing increased revenue for the former, the situation that now obtains is more favorable for the granting of straight rate advances to produce relief, it is thought. Car orders of the week have been small. A report that the Mobile & Ohio railroad has bought cars refers to a purchase made for that road by the Southern railway some weeks ago and previously reported. The Great Northern railroad is considering the building of a block of cars in its own shops, but has not yet determined to do so.

The Steel Corporation has booked contracts for about 35,000 tons of rails for export to British colonies. The Pennsylvania railroad still is conferring with rail makers to fix the typical cost of its new rail specifications, as shown by recent test rollings by the Pennsylvania Steel Co. and the Cambria Steel Co. The matter has not yet been adjusted but now is expected to be done shortly and further orders for the season's requirements of the Pennsylvania system will be distributed then. The Seaboard Air Line is about to close on its inquiry for 17,000 tons. There is considerable buying of girder rails in small lots and the aggregate tonnage makes a fair showing. The Jones & Laughlin Steel Co. has taken 1,000 kegs of standard spikes from the government for shipment to Panama.

Mills rolling standard and light rails in the Pittsburgh district advise that specifications thus far this month are equal to those received in the corresponding period in April. No attractive orders are being placed, however.

CAR AND LOCOMOTIVE ORDERS.

The Cuban Central Railways, Ltd., have ordered 13 superheater ten-wheel passenger locomotives, one superheater eight-wheel passenger locomotive and one consolidation freight locomotive, from the American Locomotive Co.

The Kansas City Southern railroad has ordered 100 Hart ballast cars from the American Car & Foundry Co.

The Chicago Northwestern railroad has placed 250 Hart ballast cars, in addition to 3,000 box cars, with the American Car & Foundry Co.

The Missouri, Kansas & Texas railroad has ordered 200 Rogers ballast cars from the American Car & Foundry Co.

The American Milling Co. has placed six general passenger service and one flat car with the Pressed Steel Car Co.

The Southern Pacific railroad is in the market for 46 motor passenger cars.

The Seaboard Air Line is in the market for 25 locomotives and also is figuring on 400 box cars and 45 coaches.

The Union Pacific railroad has awarded 107 coaches of assorted types to the Pullman Co.

Indian Rails

Will be Imported—Very Low Manufacturing Cost

New York, May 25.—Indian rails will invade the western coast of the United States for the first time within the next two weeks, when the initial cargo produced for buyers in this country by the Tata Iron & Steel Co. at Sakchi will be received.

Official announcement of this fact was made before the American Iron and Steel Institute at New York last week by Chas. P. Perin, of New York City, consulting engineer of the India company, who has just returned from a trip to the works. Mr. Perin stated that the reduction of the tariff on rails has helped considerably to enable his company to ship rails to this country, but he also outlined the astoundingly low manufacturing and operating costs of the Tata company. The 7,000 native laborers of the company receive 7 and 8 cents wages a day. Coke can be manufactured at $1 a ton and iron ore is laid down in the stock house at a remarkably low cost per unit.

Belgian rail makers also are selling some rails in this country, a lot of 1,000 tons of girder sections recently having been taken by traction interests at San Antonio, Texas.

Foundry Iron Sale

Pittsburgh, May 27. (By wire.)—A Pittsburgh consumer has closed for 500 tons of No. 3 foundry iron at $13.65, delivered. The price would net the furnace $13.

(*For complete prices see page* 984)

METAL MARKETS

New York

May 26.

Copper. — Leading copper producers now are asking 14.25c, delivered 30 days, for electrolytic and some business is being done at this price. Demand, however, is not sufficient to sustain these interests in their efforts to firm up the market and lower prices continue to be heard. At least one sale was reported during the week at 14.15c, delivered 30 days, and 14.20c is heard of occasionally. On a wholesale contract basis, electrolytic is quoted at 13.95c to 14.10c, cash. Prime casting is quoted at 13.87½c, cash, with demand dull. Prime lake is quoted at 14.25c to 14.37½c, cash, for good merchantable brands. The lake market is rather weak as a result of the increased output at the mines. The standard market is steady. Today's close on the London exchange was £63 3s 9d for spot and £63 16s 3d for three months.

Tin.—For the first time in a long while consumers are showing interest in their tin requirements and consequently the market has a better tone. Low prices continue to prevail and today 33.25c to 33.30c is asked for spot, May and June; 33.37½c for July and 33.50c for August. The London market is quiet today; during the week fluctuations have been within narrow limits. Today's London close was £150 for spot and £152 for three months.

Spelter.—This metal is held somewhat lower than last week and consumers can get all they want at 5.10c, New York, in 50-ton lots or larger. Demand is small.

Antimony.—Cookson's antimony, by reason of fresh shipments which have relieved the comparative scarcity, is held somewhat lower; inferior brands also have weakened for the same reason. Hallett's and United States, however, are unchanged. Demand is very dull. Prices on large lots, duty paid, New York, now are as follows: Cookson's 7.12½c to 7.25c; Hallett's, 7c to 7.25c; United States 7c to 7.12½c; other brands 5.75c to 5.87½c.

Chicago

May 26.

Comparatively small business is being done in new metals and prices are little different from those prevailing last week. Spelter and zinc remain the same while lead is a shade higher and tin about 1 cent lower.

We quote dealers' selling prices f. o. b. Chicago, as follows:

Lake copper, carload lots, 14.25c; casting, 14.25c; smaller lots, ¼c to ¾c higher. Spelter, car lots, 5.05c; lead, desilverized, 3.90c; sheet zinc, $7.00, f. o. b. La Salle, in car lots of 600-pound casks; pig tin, 33.75c; Cookson's antimony, 7.25c; other grades, 6c.

In old metals practically no trading is being done and both dealers and consumers are playing a waiting game. Some small tonnages are being moved but without effect on quotations, which are almost nominal. No. 1 pewter, block tin pipe and tin foil range slightly lower than was the case a week ago.

We quote dealers' selling prices f. o. b. Chicago, as follows:

Copper wire, crucible shapes, 12.75c; copper bottoms, 12.00c; heavy red brass, 11.75c; heavy yellow brass, 9.00c; No. 1 red brass borings, 10.50c; No. 1 yellow brass borings, 8.00c; brass clippings, 9.25c; lead pipe, 3.60c; zinc scrap, 4.00c; tea lead, 3.50c; No. 1 aluminum, 14.00c; No. 1 pewter, 22.50c; block tin pipe, 30.50c; tin foil, 27.00c; linotype dross 3c; electrotype dross, 3c; stereotype plates, 4.25c; stereotype dross, 3c.

Dam Blocking Business Doomed

But No One Makes Very Definite Predictions—Record Breaking Attendance at Meeting of American Iron and Steel Institute

Not only hopes, but expectations, as Judge Gary expressed it, now are entertained by iron and steel manufacturers for a revival of prosperity in this country in the not distant future. Up to this moment, business has not shown any genuine or appreciable improvement, but sentiment now is being heartened and refreshed by the increased soundness of underlying conditions and by the conviction that deferred buying long-continued, soon must burst through the dam of lost confidence that now obstructs it. There is no disposition of iron and steel makers to be strongly optimistic under present conditions. The unfavorable factors still are receiving, as they have received, full realization. That there remain deterrent and discouraging sides to the situation, needs no emphasis. Firm faith in the future, accordingly, is being tempered with feelings of conservation and reserve concerning the period that must elapse before active conditions are restored.

"UNCLE JOE"
Winning friends for his pet proposition

From a commercial aspect, these conclusions stand forth prominently in the judgments, both public and private, expressed in the largest assemblage of the iron and steel industry ever held in this country—the sixth general meeting of the American Iron and Steel Institute, at the Waldorf-Astoria, New York City, Friday, May 22.

JUDGE GARY
Telling everybody to be good

The meeting broke all records in attendance, surpassing the Chicago session last June by about a score. The registration was approximately 500 and this number was exceeded at the banquet. The technical papers and discussions composing the regular program were of high merit, some of them of extraordinary excellence, and their presentation received the most interested attention.

Judge Gary's Address.

President Gary, in his annual address, bespoke a future confidence in the justice and good sense of the American people eventually to give a fair chance to business good and small and expressed the belief that sentiment against continued agitation now is changing for the better. He said in part:

"In times of prosperity it is very easy for us to be generous in our treatment of all the questions which are presented to us for consideration and determination. In such times, it is not difficult for us to be generous to our employes and towards one another. If our mills are running at full capacity and our earnings large, and our balances in the bank entirely satisfactory, it is natural for us to pay large wages, and to deal kindly towards each other, avoiding doing anything that is unfair, giving every opportunity to inspect our mills and to know what we are doing to secure the greatest economies, and, in fact, to permit each other to know the names of our customers and even the bookings which we have; and there have been times when this generosity has been shown by those who are connected with this great industry, in a marked degree. But when the orders on our books are small and the prices are low, and the demand much below capacity to supply, we are all more or less inclined to be selfish.

"Possibly some of us are forced to do everything we can to secure orders and to take care of our own interests, regardless of the rights and interests of our competitors in business, and, also, sometimes, without regard to our obligations to our employes. Without intending to emphasize the conditions which obtain at

C. M. SCHWAB
Told the banqueters a story that hit the spot

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(First half delivery.)

Bessemer, valley	$14.00
Bessemer, Pittsburgh	14.90
Basic, Pittsburgh	13.90
Basic, eastern Pa.	14.00
Malleable, Pittsburgh	14.15 to 14.40
Malleable, Chicago	14.25
Malleable, Philadelphia	15.50 to 15.75
Malleable, Buffalo	13.00 to 13.50
No. 1X Philadelphia	15.25 to 15.50
No. 2 foundry, Pittsburgh	14.15 to 14.40
No. 2 foundry, Cleveland	14.25
No. 2 foundry, Ironton	13.50
No. 2 foundry, Chicago	14.25
No. 2X foundry, Philadelphia	14.75 to 15.00
No. 2X foundry, New York	14.75 to 15.00
No. 2X foundry, Buffalo	13.00 to 13.50
No. 2 plain, Philadelphia	14.50 to 14.75
No. 2 plain, New York	14.50 to 14.75
No. 2 plain, Buffalo	13.75
No. 2 southern, Birmingham	10.50 to 11.00
No. 2 southern, Cincinnati	13.75 to 14.25
No. 2 southern, Chicago	14.85 to 15.85
No. 2 southern, Philadelphia	14.75 to 15.00
No. 2 southern, Cleveland	14.85 to 15.35
No. 2 southern, New York	14.75 to 15.25
No. 2 southern, St. Louis	14.50 to 15.00
Virginia, 2X, Philadelphia	15.30 to 15.55
Virginia, 2X, Jersey City	15.60 to 15.85
Virginia 2X, New Eng., all rail	16.20 to 16.70
Gray forge (eastern Pa.)	13.90 to 14.25
Gray forge, Pittsburgh	13.65 to 13.90
Gray forge, Birmingham	9.50 to 10.00
Silveries, 5 per cent, Cleveland	17.30 to 17.55
Silveries, 5 per cent, Birmingham	12.50
Silveries, 5 per cent, Chicago	16.85
Silveries, 8 per cent furnace	15.75 to 16.00
Standard low phos., Phila.	21.00
Lebanon low phos., furnace	17.00 to 17.50
Low phos., Pittsburgh	21.65 to 21.90
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.75 to 16.50
Charcoal, Buffalo	16.00 to 17.00
Charcoal, Birmingham	25.00
Middlesbrough, No. 3, Phila., ex ship	15.00 to 15.25

IRON ORE

(Lower lake ports.)

Old range Bessemer, 55 per cent	$3.75
Mesabi Bessemer, 55 per cent	3.50
Old range, non-Bes., 51½ per cent	3.00
Mesabi, non-Bessemer, 51½ per cent.	2.85

(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent	7 to 8c
Foreign non-Bess., 50 to 65 per cent.	7 to 8c

COKE

(At the ovens.)

Connellsville furnace	$1.75 to 1.85
Connellsville fur. contr.	2.00
Connellsville foundry	2.40 to 2.65
Connellsville fdy., contr.	2.50 to 2.75
Wise county furnace	1.90 to 2.10
Wise county foundry	2.40 to 3.10
Pocahontas furnace	1.90 to 2.40
Pocahontas foundry	2.40 to 2.75
New River, foundry	2.75 to 3.50
New River, furnace	2.20 to 2.35

FERRO-ALLOYS

Ferro-manganese, Baltimore	$38.00
Ferro-silicon, 50 per cent, Pbgh.	71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent, Pgh.	22.90
Ferro-sil., 11 to 12 per cent, Pgh.	21.90
Ferro-sil., 10 to 11 per cent, Pgh.	20.90
Ferro-sil., 9 to 10 per cent, Pgh.	19.90
Ferro-carbon titanium, carloads, per lb.	8c to 12½c

SEMI-FINISHED STEEL

Bes. billets, Pbgh. and Yn.	$20.00
Open-hearth bl., Pbgh. and Yn.	20.00
Open-hearth bil., Phila.	22.40 to 23.40
Bes. sheet bars, Pbgh. and Yn.	21.00
Op.-h'th sh. bars, Pbgh. & Yn.	21.00
Forging billets, Phila.	26.40 to 27.40
Forging billets, Pittsburgh	25.00
Wire rods, Pittsburgh	26.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh.	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Light rails, 8 lbs., Pbgh. or Chi.	1.40c
Lgt. rails, 12 lbs., Pbgh. or Chgo.	1.35c
Lgt. rails, 16 to 20 lb., Pbgh. or Chicago	1.30c
Lgt. rails, 25 to 45 lbs., Pbgh. or Chicago	1.25c
Relaying rails, standard, Chgo.	23.00 to 24.00
Relaying rails, light, Chicago	$21.50 to 22.50
Angle bars, st. sect. Pbgh., base	1.50c
Angle bars, st., sections, Chgo.	1.50c
Spikes, railroad, Pbgh.	1.40c to 1.45c
Spikes, railroad, Chgo.	1.55c
Track bolts, Pbgh.	2.00c
Track bolts, Chgo.	2.00c

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.15c to 1.20c
Structural shapes, Chicago	1.28c to 1.33c
Structural shapes, Philadelphia	1.25c to 1.30c
Structural shapes, New York	1.26c to 1.31c
Structural shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.28c to 1.33c
Tank plates, Pittsburgh	1.10c to 1.15c
Tank plates, Philadelphia	1.25c to 1.30c
Tank plates, New York	1.26c to 1.31c
Bars, soft steel, Pittsburgh	1.15c
Bars, soft steel, Chicago	1.28c to 1.33c
Bars, soft steel, Philadelphia	1.30c to 1.35c
Bars, soft steel, New York	1.31c to 1.36c
Hoops, carloads, Pittsburgh	1.25c to 1.30c

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 pounds, to:—

New York	16 cents
Philadelphia	15 cents
Boston	18 cents
Buffalo	11 cents
Baltimore	14½ cents
Cleveland	10 cents
Cincinnati	15 cents
Chicago	18 cents
Minneapolis and St. Paul	32 cents
Denver	67½ cents
St. Louis	22½ cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast, plates and shapes	80 cents

Hoops, less carloads, Pittsburgh.	1.35c
Bands, Pittsburgh	1.15c to 1.20c
Shafting, carloads, Pbgh., disc.	65 to 66
Shaft'g less carl'ds, Pbgh., disc.	62 to 63
Bar iron, Chicago	1.10c to 1.12½c
Bar iron, Philadelphia	1.20c to 1.25c
Bar iron, New York	1.25c to 1.30c
Bar iron, Cleveland	1.20c to 1.25c
Bar iron, Pittsburgh	1.30c
Hard steel bars, Chicago	1.25c to 1.30c
Smooth finish'g mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.85c to 1.90c
No. 28 black, Chicago	1.98c to 2.03c
No. 28, tin mill, black, Pbgh.	1.85c to 1.90c
No. 28, galvanized, Pbgh.	2.80c to 2.85c
No. 28, galvanized, Chgo.	2.98c to 3.03c
No. 28, cor. galv., Pbgh.	3.00c to 3.10c
No. 28, painted cor., Pbgh.	2.10c to 2.20c
No. 10, blue annealed, Pbgh.	1.35c to 1.40c
No. 10, blue annealed, Phila.	1.55c to 1.60c
Tin plate, 100 lb., coke, base	$3.40

IRON AND STEEL PIPE

(Pittsburgh.)

	Black Butt-weld.	Galv. Butt-weld.
Steel, ⅜ to 3 inches	80	71½
Iron, ⅜ to 2½ inches	70	61
	Lap-weld.	
Steel, 2½ to 6 inches	79	70½

BOILER TUBES

Steel, 3½ to 4½ inches	72
Iron, 3½ to 4½ inches	60

WIRE PRODUCTS

Wire nails, jobbers, Pittsburgh	$1.55 to 1.60
Wire nails, retailers, Pittsburgh	1.60 to 1.65
Plain wire, jobbers, Pittsburgh	1.35 to 1.40
Plain wire, retailers, Pittsburgh	1.40 to 1.45
Galvanized wire, jobbers, Pbgh.	1.75 to 1.80
Galvanized wire, retailers, Pbgh.	1.80 to 1.85
Polished staples, Pbgh.	1.55 to 1.60
Galvanized staples, Pbgh.	1.95 to 2.00
Barb wire, painted, jobbers, Pbgh.	1.55 to 1.60
Barb wire, painted, retailers, Pbgh.	1.60 to 1.65
Barb wire, galv., retailers, Pbgh.	2.00 to 2.05
Barb wire, galv., jobbers, Pbgh.	1.95 to 2.00

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled threads, 80 and 10; cut threads, 80 and 5; larger or longer, 75 and 10.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter, rolled, 80 and 15; cut, 80 and 10; larger or longer, 75 and 15.

Gimlet and cone point lag or coach screws, 80 and 20.

Hot pressed square, blank or tapped nuts, $6.80 off list; hot pressed hexagon blank or tapped, $7.20 off.

Cold pressed, C. & T. square, blank or tapped, $6 off; hexagon, blank or tapped, ½ inch and larger, $7.20; ½-inch and smaller, $7.80.

RIVETS

Structural rivets, Pbgh.	1.60c to 1.65c
Structural rivets, Chgo.	1.73c to 1.78c
Boiler rivets, Pbgh.	1.70c to 1.75c
Boiler rivets, Chgo.	1.83c to 1.88c

SCREWS

(New York.)

Lag, gimlet and cone point	80 and 20
Coach, gimlet point	80
Standard jack	70 and 10
Mch., cut thread, flat head	50 and 10
Mach., cut thread, round head	50 and 10 and 10
Mch., cut thread, fillister hd.	40 and 40 and 10
Mch., rolled thread, flat head or round head	80 and 10
Set screws, iron	75 and 10 and 10
Set screws, steel, per cent advance over iron	25
Square head cap screws	70 and 10 and 10
Hexagon head cap screws	70 and 10 and 10
Fillister head cap screws	60 and 10 and 10
Flat head wood screws	10 and 10 and 5
Round head wood screws	10 and 10 and 5

WASHERS

(Discounts, Iron or Steel, to Jobbers, Cleveland.)

⅛-inch	$7.25
3/16-inch	7.00
¼-inch	7.00
5/16-inch	7.00
¾-inch	7.00

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	1.55c to 1.60c

TWISTED REINFORCING BARS

(Soft steel, Pittsburgh mill.)

¾-inch and larger	1.25c
5/8-inch	1.30c
½-inch	1.35c
3/8-inch	1.50c
¼-inch	1.75c

IRON AND STEEL PRICES

Corrected up to Tuesday noon

TACKS

(New York.)

	Discount.
American carpet tacks	90 and 20 and 10
American cut tacks	90 and 20 and 10
Railroad tacks	90 and 40
Gimp tacks	90 and 20 and 10
Finishing nails	70

WIRE ROPE

Galvanized, iron and steel	47½ and 2½
Bright, iron and steel	55 and 2½

TRIANGLE REINFORCING MESH

(Per 100 square feet f. o. b. mill, car loads.)

No. 4, plain	$1.00
No. 4, galvanized	1.12
No. 7, plain	.49
No. 7, galvanized	.55
No. 23, plain	1.69
No. 23, galvanized	1.88
No. 26, plain	1.17
No. 26, galvanized	1.30
No. 27, plain	.96
No. 27, galvanized	1.07
No. 31, plain	2.49
No. 31, galvanized	2.76
No. 35, plain	1.17c
No. 35, galvanized	1.30
No. 39, plain	3.05
No. 39, galvanized	3.38
No. 43, plain	1.10
No. 43, galvanized	1.23

SPIRAL RIVETED PIPE

(Per 100 linear feet, f. o. b. factory.)

4-inch, plain	$ 19.76
4-inch, galvanized	30.74
6-inch, plain	33.05
6-inch, galvanized	49.73
8-inch, plain	43.17
8-inch, galvanized	65.00
10-inch, plain	66.42
10-inch, galvanized	96.15
12-inch, plain	83.75
12-inch, galvanized	118.30
14-inch, plain	99.14
14-inch, galvanized	138.85
16-inch, plain	117.53
16-inch, galvanized	166.58
20-inch, plain	183.79
20-inch, galvanized	248.39
24-inch, plain	219.92
24-inch, galvanized	293.99
30-inch, plain	324.81
30-inch, galvanized	430.64

CAST IRON PIPE

Three to 24 in., Cleveland	$22.35 to 22.80
Four-inch, water, Chicago	26.50
Six to 12 inches, Chicago	24.50
Larger sizes, Chicago	24.00
Six inch, water, New York	21.00 to 22.00
Four-inch, water, Birmingham	21.50
Six inch and larger, Birmingham	19.50

Gas pipe, $1 per ton higher than water.

WAREHOUSE PRICES

Steel bars, Chicago	1.65c
Steel bars, Cleveland	1.80c
Steel bars, Cincinnati	1.70c to 1.85c
Steel bars, Philadelphia	1.65c to 1.70c
Steel bars, New York	1.80c
Iron bars, Chicago	1.65c
Iron bars, Cleveland	1.75c
Iron bars, Cincinnati	1.65c to 1.75c
Iron bars, Philadelphia	1.60c to 1.65c
Iron bars, New York	1.65c to 1.70c
Hoops, Chicago	2.15c
Shapes and plates, Chicago	1.75c
Shapes and plates, Cleveland	1.90c
Shapes and plates, Cincinnati	1.80c to 1.90c
Shapes and plates, Philadelphia	1.65c to 1.70c
Shapes and plates, New York	1.85c
No. 10 blue ann. sheets, Chgo.	1.95c
No. 10 blue ann. sheets, Cleve.	2.15c
No. 10 blue ann. sheets, Cinci.	1.95c to 2.05c
No. 28 black sheets, Chgo	2.55c
No. 28 black sheets, Cleveland	2.60c
No. 28 black sheets, Cincinnati	2.45c to 2.55c
No. 28 galv. sheets, Chgo	3.60c
No. 28 galv. sheets, Cleveland	3.60c
No. 28 galv. sheets, Cincinnati	3.45c to 3.55c

IRON AND STEEL SCRAP

(Net tons.)

No. 1 railroad wrought, Chgo.	$ 8.75 to 9.00
No. 1 railroad wrought, Cleve.	9.50 to 10.00
No. 1 railroad wrought, St. L.	7.75 to 8.00
No. 1 railroad wrought, Cinci.	8.00 to 8.50
No. 2 railroad wrought, Chgo.	8.25 to 8.50
No. 2 railroad wrought, St. L.	7.50 to 7.75
Arch bars and transoms, Chgo.	12.00 to 12.50
Arch bars and transoms, St. L.	11.00 to 11.50
Knuckles, coup. and spr'gs, Chgo.	9.00 to 9.50
Knuckles, coup., and sp'gs, St. L.	9.00 to 9.25
Shafting, Chicago	11.50 to 12.00
Shafting, St. Louis	13.00 to 13.50
Steel car axles, Chgo	12.25 to 12.50
Steel car axles, St. Louis	11.50 to 11.75
Locomotive tires, Chicago	9.75 to 10.00
Locomotive tires, St. Louis	9.00 to 9.50
Cut forge, Chicago	8.25 to 8.50
Pipes and flues, Chicago	6.50 to 7.00
Pipes and flues, Cleveland	8.00 to 8.50
Pipes and flues, St. Louis	6.50 to 7.00
No. 1 cast, Chicago	9.75 to 10.25
No. 1 cast, Cleveland	10.75 to 11.00

Freight Rates, Coke

Connellsville regions, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.70
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley furnaces	1.20
Cincinnati	2.00

No. 1 cast, Cincinnati	9.25 to 9.75
No. 1 cast, St. Louis	10.00 to 10.50
No. 1 busheling, Chicago	7.25 to 7.75
No. 1 busheling, Cleveland	8.50 to 9.00
No. 1 busheling, Cincinnati	6.00 to 6.50
No. 1 busheling, St. Louis	7.50 to 8.00
No. 2 busheling, Chicago	6.00 to 6.25
No. 1 boiler plate, cut, Chgo.	6.50 to 7.00
No. 1 boiler plate, cut, Buffalo	9.00 to 9.50
No. 1 boiler plate, cut, St. L.	6.00 to 6.50
Boiler punchings, Chicago	9.00 to 9.25
Cast borings, Chicago	4.75 to 5.25
Cast borings, Cleveland	6.00 to 6.50
Cast borings, Cincinnati	4.25 to 4.75
Cast borings, St. Louis	4.00 to 4.50
Machine shop turnings, Chgo.	5.25 to 5.50
Machine shop turnings, Cleve.	5.50 to 6.00
Machine shop turnings, Cinci.	4.50 to 5.00
Machine shop turnings, St. L.	4.50 to 5.00
Malleable, agricultural, Chgo.	8.25 to 8.75
Malleable, agricultural, St. Louis	7.25 to 7.50
Malleable, railroad, Chicago	9.25 to 9.75
Malleable, railroad, Cincinnati	6.50 to 7.00
Malleable, railroad, St. Louis	8.00 to 8.25
Angle bars, iron, Chgo	11.75 to 12.25
Angle bars, iron, St. Louis	10.00 to 10.50
Angle bars, steel, Chgo	8.25 to 8.75
Angle bars, steel, St. Louis	9.00 to 9.50
Stove plate, Chicago	9.25 to 9.75
Stove plate, Cleveland	8.25 to 8.75
Stove plate, Buffalo	9.75 to 10.00
Stove plate, Cincinnati	7.00 to 7.50
Stove plate, St. Louis	7.50 to 8.00
Bundled sheet, Cincinnati	4.75 to 5.25
Wrought iron pil'g plates, Clev.	13.00

(Gross Tons.)

Heavy melting steel, Pbgh	$12.00
Heavy melting steel, Buffalo	10.00 to 10.50
Heavy melting steel, Chicago	9.75 to 10.00
Heavy melting steel, Cleveland	10.00 to 10.75
Heavy melting steel, Cincinnati	9.00 to 9.50
H'vy melting steel, eastern Pa.	10.75 to 11.00
Heavy melting steel, New York	8.50 to 8.75
Heavy melting steel, St. Louis	11.00 to 11.50
Bundled sheet, Buffalo	6.25 to 6.50
Grate bars, Buffalo	9.50 to 10.00
Grate bars, New York	6.00 to 6.25
No. 1 railroad wr'ght, east. Pa.	12.50 to 12.75
No. 1 railroad wrought, Pbgh.	11.00 to 11.50
No. 1 R. R. wght., New York	11.00 to 11.50
No. 1 R. R. wrought, Buffalo	11.00 to 11.50
Shafting, New York	12.00 to 12.50
Pipes and flues, New York	8.00 to 8.25
Pipes and flues, eastern Pa.	10.00 to 10.50
Mch. shop turnings, New York	5.50 to 5.75
Machine shop turnings, Buffalo	5.50 to 6.00
Mch. shop turnings, Pbgh	7.75 to 8.00
Mch. shop turnings, eastern Pa.	7.50 to 8.00
Cast borings, New York	5.50 to 5.75
Cast borings, eastern Pa.	8.00 to 8.50
Cast borings, Buffalo	6.00 to 6.50
Cast borings, Pittsburgh	7.75 to 8.00
Stove plate, (Jersey points)	8.75 to 9.00
Stove plate, Pittsburgh	10.00 to 10.25
Stove plate, eastern Pa.	8.50 to 9.00
Shoveling steel, Chicago	9.25 to 9.50
Shoveling steel, St. Louis	9.00 to 9.50
Reroll'g rails, 5 ft. & ov., Pbgh.	13.00 to 13.25
Reroll. rails, 5 ft. and ov., Chgo.	11.25 to 11.75
Reroll. rails, 5 ft. and ov., Cleve.	11.75 to 12.25
Reroll. rails, 5 ft. & ov., E. Pa.	12.25 to 12.75
Reroll. rails, 5 ft. and ov., St. L.	12.00 to 12.50
Steel rails, short, Chicago	10.50 to 10.75
Steel rails, short, Cleveland	13.00 to 13.50
Steel rails, short, eastern Pa.	11.00 to 11.25
Steel rails, short, St. Louis	11.50 to 12.00
Iron rails, Cleveland	13.50 to 14.00
Iron rails, Cincinnati	10.50 to 11.00
Iron rails, eastern Pa.	15.00 to 16.00
Iron rails, St. Louis	12.00 to 12.25
Frogs, switches, guards, Chgo.	9.50 to 9.75
Frogs, switches and g'rds, St. L.	10.25 to 10.50
Car wheels, (iron), Pittsburgh	12.00 to 12.50
Car wheels (steel) Pittsburgh	13.00 to 13.50
Car wheels, Chicago	11.25 to 11.50
Car wheels, eastern Pa.	11.75 to 12.00
Car wheels, Buffalo	12.00 to 12.50
Car wheels, N. J. points	11.50 to 12.00
Car wheels, St. Louis	11.00 to 11.25
Iron axles, Pittsburgh	22.50 to 23.00
Iron axles, Cincinnati	19.00 to 20.00
Iron axles, eastern Pa.	20.00 to 21.00
Iron axles, Buffalo	21.50 to 22.00
Iron axles, Chicago	19.00 to 19.50
Steel car axles, New York	12.25 to 12.75
Steel car axles, Buffalo	15.00 to 15.50
Steel car axles, Cleveland	16.50 to 17.00
Steel car axles, eastern Pa.	14.00 to 14.50
No. 1 busheling, Buffalo	8.50 to 9.00
No. 1 busheling, Pittsburgh	10.00 to 10.25
No. 2 busheling, Buffalo	6.00 to 6.50
Low phosphorus steel, Buffalo	15.00 to 15.50
Low phosphorus steel, Pbgh.	14.00 to 14.25
Low phos. steel, eastern Pa.	14.50 to 15.00
No. 1 forge, eastern Pa.	8.50 to 9.00
No. 1 cast eastern Pa.	12.00 to 12.50
No. 1 cast, Pittsburgh	12.00 to 12.25
No. 1 heavy cast (N. J. points)	11.75 to 12.00
Boiler plate, Cleveland	7.50 to 8.00
Mall. iron, agricul., Cleveland	9.00 to 9.50
Mall. iron R. R., Cleveland	10.50 to 11.00
Malleable, railroad, Pittsburgh	10.00 to 10.25
Malleable R. R. Buffalo	10.75 to 11.25
Mal., R. R. east. Pa.	9.00 to 9.50
Bundled sheet, Pittsburgh	8.50 to 8.75
Bundled sheet, Cleveland	6.50 to 7.00

MISCELLANEOUS SHOP TOOLS

	Discount.
Standard files	80 and 5
Heavy hammers, 3 to 5 lb.	80 and 10
Heavy hammers, over 5 lb.	80 and 5
Gas pliers, 7-inch, per dozen	$2.00
Gas pliers, 12-inch, per dozen	3.50
Cold chisels, per pound	12c to 15c
Wrenches, Alligator, discount	75 and 80
Wrenches, drop forged S.	50 and 10

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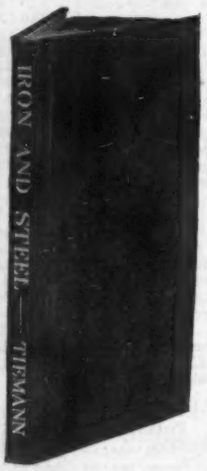

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ADDRESS

The Iron Trade Review
CLEVELAND, OHIO

Making Bessemer Steel

(*Continued from page* 919)

per heat in fixed open-hearth furnaces is reduced so much that an increase of output amounting to nearly 50 per cent is counted upon. A pair of 180-ton tilting open-hearth furnaces run on the continuous principle, in which only part of the heat is tapped at a time, have produced over 20,000 tons of steel in a month when working by the duplex process.

The equipment employed consists of one or more large mixers to hold the molten basic pig iron from the blast furnaces; two or three Bessemer vessels of a size suited to the open-hearth capacity they serve; a battery of fixed or tilting open-hearth furnaces; a smaller mixer to hold the molten Bessemer pig iron from the blast furnaces which is used for recarburizer; cupolas to melt spiegeleisen, if any is used as recarburizer; and, of course, the necessary cranes, ladles, transfer cars, etc.

Exact data of the practice followed is difficult to secure. Generally, however, from 60 to 80 per cent of the pig iron is full blown in the vessels, leaving some 0.10 per cent of carbon in the metal, and the balance partly blown, eliminating the silicon and manganese, and leaving some 1.50 to 2 per cent of carbon. The proportion of carbon in the metal charged to the open-hearth furnaces is such that there shall be enough of it to assist in heating up the bath, by the bubbling consequent upon its elimination, as in ordinary open-hearth practice.

In fixed furnaces, a part of the charge may be cold scrap. Frequently, however, only the spout scrap, etc., is melted, and the proportion charged is seldom over 10 per cent. The heats are worked with lime and iron ore as in ordinary practice. In large tilting furnaces, often only a part of the heat is taken out at each tap, and a portion of the bath left in the furnace. After tapping, iron ore or scale and lime are charged, the bath and slag are made very hot, and the fresh charge of molten Bessemer metal is then poured in. The reaction between the iron oxide of the ore or scale and the carbon of the added metal is completed rapidly, and the bath got ready for tapping as soon as possible.

In the manufacture of high carbon steel for rails, the bath is worked until the carbon is reduced to about 0.10 per cent or less. The great weight of carbon that has to be added to bring this soft steel up to some 0.60 or 0.70 per cent carbon, makes it almost impossible to secure uniform results if coal or coke is used as the source of the carbon. For this reason pig iron is generally used as recarburizer for these hard steel heats, and so much of it is used that it has to be pre-melted. In fixed furnaces, it may be poured into the furnace or the ladle; when the continuous process is used, it must be poured in the ladle. This pig iron is generally kept hot as received from the blast furnaces in a small mixer. A separate mixer and supply of iron for recarburizer is essential, because Bessemer iron must be used for the purpose. If the basic iron from the main supply were used for recarburizer, the amount of phosphorus it contains would raise the phosphorus content of the finished steel to a prohibitive degree.

In the manufacture of low carbon steels for structural material, the recarburizer may be used solid, since the amount used is so small that it melts quite rapidly if shoveled into the ladle.

Electric Refining

The electric furnace offers a method by which molten Bessemer steel may be de-phosphorized, de-sulphurized and freed from oxides, even more completely than in the basic open-hearth furnace. The high cost of electric

furnace de-phosphorizing compared to open-hearth costs, however, will no doubt confine the use of electric furnace refining to the production of only very high grade steels for special purposes, at least for some years to come.

Plain Bessemer steel is still widely used for merchant material, and the output of Bessemer steel is not falling off, though the open-hearth process has now taken the lead in production and is rapidly increasing its lead. The figures in the accompanying table illustrate clearly the growth of the annual output of steel made by the different processes. In 1912, of the 20,780,723 tons of open-hearth steel produced, 1,438,654 tons were made by the duplex process. This steel was produced by seven works, in four states, as follows: Pennsylvania, four; Maryland, one; Alabama, one, and Illinois, one. The exact statistics for 1913 are not yet available.

Forthcoming Meetings

American Foundrymen's Association.—A. O. Backert, secretary, Penton building, Cleveland. Convention Sept. 7-10, La Salle hotel, Chicago.

American Hardware Manufacturers' Association.—F. D. Mitchell, secretary, 1510 Woolworth building, New York. Next meeting to be held jointly with Southern Hardware Jobbers' Association at White Sulphur Springs, West Va., June 9-11.

American Institute of Electrical Engineers.—F. L. Hutchinson, secretary, 33 West Thirty-ninth street, New York. Next meeting at Detroit, June 23-26.

American Institute of Mining Engineers.—Bradley Stoughton, secretary; Albert Sauveur, chairman of Iron and Steel Committee, 29 West Thirty-ninth street, New York. Next meeting in Salt Lake City, Aug. 10-14.

American Iron and Steel Institute.—James T. McCleary, secretary, 30 Church street, New York. Next meeting, May 22 and 23, 1914, at New York.

American Society for Testing Materials.—Prof. E. Marburg, secretary, University of Pennsylvania, Philadelphia. Next meeting, June 30 to July 4, at Hotel Traymore, Atlantic City, N. J.

American Society of Civil Engineers.—C. W. Hunt, secretary, 220 West Fifty-seventh street, New York. Regular meetings at New York, first and third Wednesday of each month, except June and August.

American Society of Mechanical Engineers.—Calvin W. Rice, secretary, 29 West Thirty-ninth street, New York. Next meeting, June 16-19, at University of Minnesota, Minneapolis.

American Railway Engineering Association.—E. A. Fritch, secretary, 900 South Michigan avenue, Chicago. Next meeting in March, 1915, at Chicago.

Association of Iron and Steel Electrical Engineers.—W. T. Snyder, secretary, National Tube Co., McKeesport, Pa. Next convention, Sept. 14-19, Cleveland, O.

Chicago Foundrymen's Club.—C. E. Hoyt, secretary, Lewis Institute, Chicago. Regular meetings at Sherman hotel, on second Saturday of each month.

Engineers' Society of Western Pennsylvania.—Elmer K. Hiles, secretary, Oliver building, Pittsburgh. Regular meetings, third Tuesday of each month.

Lake Superior Mining Institute.—A. J. Yungbluth, secretary, Ishpeming, Mich. Next meeting on Marquette range, in August, 1914.

National Founders' Association.—W. H. Barr, president. Lumen Bearing Co., Buffalo; J. M. Taylor, secretary, Chicago; A. E. McClintock, commissioner, Chicago. Next meeting in New York, in November, 1914.

National Metal Trades Association.—J. D. Hibbard, commissioner, Chicago. Next meeting in spring of 1915; city to be announced later.

New England Foundrymen's Association.—Fred F. Stockwell, secretary, 205 Broadway, Cambridgeport, Mass. Regular meetings, second Wednesday of each month, at Exchange Club, Boston.

Philadelphia Foundrymen's Association.—Howard Evans, secretary, Pier 45 North, Philadelphia. Regular meetings, first Wednesday of each month, at Manufacturers' Club.

Superintendents' and Foremen's Club of Cleveland.—Philip Frankel, secretary, 310 New England building, Cleveland. Regular meetings, third Saturday of each month.

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THE OPEN HEARTH

Let the Facts be Known

THE people of the United States are justly proud of the Panama canal. They are proud, not only because the many problems of engineering and sanitation were solved, but also because the tremendous undertaking was carried nearly to completion with entire freedom from charges of dishonesty on the part of government employes or of contractors and their employes. It is indeed deplorable that this clean record is now marred by charges of attempting to defraud the government made against employes of a sub-contractor, the Carbon Steel Co. True it is, that the original newspaper telegrams sent out from Pittsburgh May 21, and widely published, were absolutely false so far as they alleged that it was charged "that the steel furnished was of such inferior quality that the immense locks at the dam in the canal are liable to let go at any time, causing heavy loss of property and probably lives". No such sensational charge was ever made, but if it had been in the indictment, it would not have been sustained. Major Boggs, of the Isthmian Canal Commission offices at Washington, asserts that the attempt to deliver defective steel was discovered by the inspectors and that there is no defective steel in the locks.

In spite, however, of the false reports which have been disseminated, the charges really made are grave and we believe that nobody will be more anxious to have the whole truth known than will men connected with the steel business, who are determined that they will not share any of the disgrace of shielding anyone in the business who has been guilty of attempting to defraud the government. Certainly the proper spirit of co-operation with the government is being shown by the new officers of the Carbon Steel Co.

The exhibit given in Cleveland last week to illustrate the effect of the use of intoxicating liquor in causing accidents and interfering with the efficiency of workmen is typical of the new methods of fighting intemperance. Doubtless with some men, the old, emotional method is effective and we are not disposed to rob the sensational evangelist of any credit that is due him for inducing men to lead sober lives, but in the long run and in the majority of cases, we believe that the unemotional method is preferable. Certain it is that now as never before, workingmen are being shown most impressively that the intemperate man cannot succeed as can the man who abstains.

The Call to Service

THE declination of H. A. Wheeler to serve as a member of the Federal Reserve Board is a matter for sincere regret. Mr. Wheeler is admirably equipped to serve on this important board and it is not easy for the President to find men of the highest ability to assist in inaugurating the new banking act. For men of large affairs to serve on the board means to make sacrifice, but that is what business men must do if the great problems relating to the connection between business and government are to be satisfactorily solved.

It is very common for business men to complain that public officials have neither the experience nor natural ability properly to discharge their duties. Even the Interstate Commerce Commission members have been branded as men not big enough for their jobs. At a recent meeting of important business men of a large city in the central west, the plan to establish a trade commission was under discussion. Some severe criticisms were made concerning the personnel of public officials. Thereupon, one of the critics was asked the blunt question whether he would accept a position on the trade commission at the proposed salary and the frank reply was that he would not. One business man then expressed the opinion that there was not a man in the meeting who would accept the position. In other words, there was not a man who would make the personal sacrifice necessarily involved in the acceptance of the position. There is but one alternative, unless salaries of public officials, particularly those connected with commissions, are raised. Sacrifice of business and personal interests on the part of those called to enter the public service and thereby serve their country will be imperative.

Views on the Business Outlook

Gleaned at the Meeting of the American Iron and Steel Institute

E. H. GARY, Steel Corporation.

"We are going to have an abundant crop this year and it will have its influence on business conditions. Crops are something that cannot be taken away from us, even by the politicians. We shall see improvement. This country is just as big as it ever was; it is growing just as fast. It is rich and it is bound to be prosperous."

WILLIS L. KING, Jones & Laughlin Steel Co.

"I feel indications are for an improvement in demand and I believe in prices, in the not-distant future."

JAS. A. FARRELL, Steel Corporation.

"In my opinion, based upon a careful survey of the situation, an improvement in trade conditions, both as to tonnage and values, is not far off."

LEONARD H. PECKITT, Empire Steel & Iron Co.

"Business will go along about as now, in my opinion, until around August, when the first signs of real improvement should appear. Everything indicates this. The railroads will be properly treated and business then will go along as it should go."

EDGAR C. FELTON, Pennsylvania Steel Co.

"Were it not for the threat of importations, we would have pretty good business this fall, I think. Congress then would be adjourned, the freight rate case settled and good crops assured, and that should stimulate business."

A. F. HUSTON, Lukens Iron & Steel Co.

"I believe by midsummer, we will have better conditions. Judging the future by the past, there must be some change soon."

F. S. WITHERBEE, Witherbee, Sherman & Co.

"Good crops, the adjournment of congress and a satisfactory settlement of the railroad rate case, ought to bring considerable improvement by Sept. 1."

JOS. G. BUTLER, JR.

"We are getting nearer every day to an era of prosperity, I think. We now are five months nearer than Jan. 1. A favorable result of the elections this fall will count for much in a business way."

JOHN A. TOPPING, Republic Iron & Steel Co.

"The situation is very much mixed. We all feel that conditions are about as bad as they can be, but are afraid the change for the better will be slow. I do not see much ground for the expectation of a rapid change."

JAS. A. CAMPBELL, Youngstown Sheet & Tube Co.

"We are going to have better business, but not much better prices in the near future, in my opinion. The bottom has been reached and some price advances must come, as some lines of steel are selling below cost. I am not certain that a change for the better has not already set in."

M. C. ARMOUR, Rogers, Brown & Co.

"Within sixty or ninety days, I look for a considerable improvement. There now are a good many indications of a change for the better. Inquiries for iron are more numerous and aggregate a considerable tonnage."

SEVERN P. KER, Sharon Steel Hoop Co.

"I believe things are at the bottom and any change will be in the direction of improvement. This change, I think, however, will be considerably delayed."

Prices Present and Past

Quotations on leading products today, average for last month, average for three months ago and average for April, 1913. Prices are those ruling in the largest percentage of sales at the dates named.

	Today's prices.	Average for April, 1914.	Average for Feb., 1914.	Average for May, 1913.
Bessemer pig iron, Pittsburgh..	$14.90	$14.90	$15.09	$17.90
Basic pig iron, Pittsburgh.....	13.90	13.90	14.09	15.46
No. 2 Fdy. pig iron, Pittsburgh	13.90	14.15	14.09	15.04
Northern No. 2 Fdy., Chgo....	14.25	14.25	14.25	16.50
Lake Superior Charcoal, Chgo.	16.00	16.00	18.50	18.00
Malleable Bessemer, Chicago...	14.25	14.25	14.25	16.50
Southern No. 2, Birmingham..	10.50	10.50	10.50	11.70
Southern Ohio No. 2, Ironton.	13.50	13.50	13.00	15.00
Basic, eastern Pa.....	14.00	14.25	14.25	16.50
No. 2X Virginia furnace.....	12.75	12.75	12.75	14.50
No. 2X Foundry, Philadelphia.	15.00	15.00	15.00	17.00
Ferro manganese, Baltimore....	38.00	38.50	36.50	61.75
Bessemer billets, Pbgh. & Ygn.	20.00	20.80	21.00	26.50
Op. h'th billets, Pbgh. & Yn..	20.00	20.80	20.75	26.50
Bess. sheet bars, Pbgh. & Yn.	21.00	21.60	22.00	27.50
Op. h'th sh. bars, Pbgh. & Yn.	21.00	21.60	21.75	27.50
Steel bars, Pittsburgh.....	1.15	1.20	1.20	1.40
Iron bars, Philadelphia.....	1.22	1.22	1.27	1.57
Steel bars, Chicago.....	1.28	1.43	1.43	1.58
Tank plates, Chicago.....	1.28	1.33	1.38	1.63

	Today's prices.	Average for April, 1914.	Average for Feb., 1914.	Average for May, 1913.
Structural shapes, Chicago.....	$1.28	$1.35	$1.38	$1.63
Iron bars, Cleveland.....	1.20	1.25	1.30	1.63
Iron bars, Chgo. mill.....	1.10	1.15	1.20	1.57½
Beams, Pittsburgh	1.15	1.18	1.20	1.45
Beams, Philadelphia	1.25	1.30	1.30	1.60
Tank plates, Pittsburgh.....	1.10	1.15	1.20	1.45
Tank plates, Philadelphia.....	1.25	1.30	1.30	1.75
Sheets, blk., No. 28, Pittsburgh	1.85	1.92	1.94	2.28
Sheets, blue ann., No. 10, Pbgh.	1.35	1.40	1.40	1.75
Sheets, galv., No. 28, Pbgh....	2.80	2.92	2.94	3.39
Wire nails, Pittsburgh.....	1.55	1.60	1.59	1.78
Connellsville fur. coke, contr..	2.00	2.00	1.92	2.25
Connellsville fdy. coke contr...	2.50	2.50	2.50	3.00
Heavy melting steel, Pbgh....	12.00	12.00	12.37	13.06
Heavy melting steel, east'n Pa.	10.75	11.00	10.50	12.50
Heavy melting steel, Chgo.....	9.75	10.25	9.70	12.50
Heavy cast, eastern Pa.....	12.50	13.00	12.50	13.50
No. 1 wrought, eastern Pa....	12.50	14.50	13.50	15.50
No. 1 wrought, Chgo.....	8.75	9.00	9.50	9.20
Rerolling rails, Chgo.....	11.25	11.75	11.63	14.00
Car wheels, Chgo.....	11.25	11.50	12.25	17.00

(For Additional Prices See Page 984.)

Heavier Pig Iron Inquiry in East

And More Interest is Also Displayed at Chicago—Foundry Iron Weak at Pittsburgh

Pressing necessities are forcing a large number of iron consumers into the market at New York and vicinity, making the inquiring heavier and more distributed, but the situation still lacks a healthy tone. The Sessions Foundry Co., Bristol, Conn., is inquiring for 4,000 tons of Nos. 1X and 2 plain for last half. This is the most attractive inquiry recently offered in that territory and it promises to set more clearly the range of prices actually available at all-rail New England points. A Jersey machinery builder asks 1,800 tons of Nos. 1X and 2 plain, third quarter; a Jersey stove maker is out for 500 to 1,000 tons of two grades; a Newark hoisting equipment maker, with an inquiry for 500 tons of No. 2X is debating between withdrawing and buying a larger quantity; another lot of 600 tons and similar requirements are pending. A Bridgeport, Conn., steel maker still figures tentatively on about 10,000 tons of basic for last half. Eastern furnaces continue to figure upon the requirement of 60,000 tons of iron for the cast iron segments for East river tubes, bids on the general contract for which were opened the past week. Iron sales in the New York district still remain modest. A Newark foundry inquiring for 3,000 tons of Nos. 1X and 2 plain, bought about half this amount, the business being reported to have gone to a Schuylkill valley maker at below $14.75, delivered. The usual range for No. 2X at tidewater is $14.75 to $15.

Eastern Pipe Makers Figure

No immediate effect upon the buying scope of the pig iron market of Philadelphia and vicinity from the heavy movement in basic of the preceding week in that territory is observable. Consumers, as a rule, still appear indifferent. At the moment, the efforts of the cast iron pipe makers to develop lower prices precedent to the probable closing of some heavy tonnages for Delaware River and other plants stand out most prominently. These buyers are aiming to develop from southern makers a schedule of $10, Birmingham, for No. 2, $9.50 for No. 3 and $9 for forge, equivalent to $14.20, $13.70 and $13.20, delivered, respectively, in Delaware River territory. It is understood that some round lots would be taken at such prices, but southern makers are resisting any further cuts. The Standard Cast Iron Pipe & Foundry Co. has closed with southern makers for a portion of its recent inquiry for 3,000 tons of early iron at $14.20, delivered, for No. 3 and $13.70 for forge, or $10 and $9.50, Birmingham, respectively, for these grades. Virginia pipe makers have closed for about 2,000 tons of low grade iron with Virginia furnaces. The ordinary run of foundry iron business is small. Low phosphorus buying also is light. No further sales of basic for eastern Pennsylvania delivery have resulted. There appears still to be some doubt as to the tonnage actually taken recently by one of the Harrisburg works. Prices in all grades show only minor changes indicating that they practically are at bottom. One of the Lackawanna Iron & Steel Co. stacks at Lebanon is to go out soon, leaving one furnace blowing.

Buffalo Sales

The orders in the Buffalo market amounted to between 15,000 and 20,000 tons of all grades, being the largest total reported in a great many weeks. The orders booked were for third and fourth quarter deliveries, principally for third quarter, most of the iron being for users outside of the Buffalo territory.

A larger amount of inquiry has been noted during the week, but from users seeking to place orders slightly below the prevailing market quotations. The

(*For complete prices see page* 984)

producing interests say this situation usually precedes the development of actual buying and will continue until the market is again established. There is a disposition on the part of the furnace men to waive grade differences to some extent on favorable tonnages and deliveries in order to secure the business.

Melters in the Buffalo district are not feeling any appreciable improvement in demand for their products, in fact the general situation with them is one of dullness and a dropping off in consumption. Some of the foundries, owing to the depression of business, are compelled to curtail forces to a greater extent, keeping operations down until there is a release of the business being held back.

Foundry Weaker at Pittsburgh

The Standard Sanitary Mfg. Co., Pittsburgh, has closed for 1,000 tons of No. 2 foundry for June and July shipment to plants at Allegheny and New Brighton, Pa., at $13.90, delivered, or 25 cents a ton less than the previous minimum quotation for this grade. Some valley interests continue to ask $13.50, valley, for both No. 2 foundry and malleable grades, but it is apparent the former can be laid down in Pittsburgh at considerably less. The American Steel Foundries have not yet closed for 10,000 tons of basic for shipment to plants at Sharon, Pa., and Alliance, O., being unable to obtain iron at less than the current price. For the first time in several months, a few of the heaviest melters have displayed interest in the future market, but actual sales show no improvement and prices, too, have not strengthened.

The interest caused by the increased activity in basic has subsided in the Cleveland district and the dullness of earlier weeks again prevails. One company which has quoted $13.25, valley, on No. 2 foundry has made moderate sales; while the companies asking $13.50, valley, are doing practically no business. Two purchases of 8 per cent silicon, 300 tons each, were made at $16, Jackson, and the market seems to have considerable firmness at that figure.

Inquiry Better at Chicago

Considerable increase of inquiry for foundry grades of pig iron has been experienced recently, although of rather a listless sort. Buyers apparently are seeking to ascertain what prices can be made, but are not anxious to close contracts for third quarter or last half. However, some tonnage is being placed on the books for third quarter and a less quantity for the full half. Furnaces in this district are repeating the tactics pursued since the buying movement in January, quoting No. 2 foundry and malleable at $14.25, Chicago furnace, for third quarter, but asking $14.75 for full last half or for fourth quarter.

The idea still obtains that a heavier demand is coming and pig iron makers are holding whatever advantage they can by discouraging contracts more than three months in advance. With considerable tonnage on the books in the shape of orders deferred from first half, furnaces promise to enter third quarter with shipments and output fairly well balanced on a basis of 50 per cent operations. Some interests here find shipments considerably larger than output and such stocks as have been accumulated are being drawn upon.

Some makers of southern iron claim nothing is being done at higher than $10.50, Birmingham, for No. 2 foundry, while others contend sales are being made at $10.75, Birmingham, for last half delivery.

Uneasy at Cincinnati

A feeling of unrest is very evident in the Cincinnati market. It is known that buying has been a little better during the past week, but transactions have been of such a secret nature that the market in general has not received any definite information about them. The Portsmouth Steel Co., Portsmouth, is about to close for 10,000 tons of basic. Prices have been submitted on this business and various furnaces of southern Ohio are waiting to see how it will be distributed. A sale of 1,400 tons of southern foundry iron has been made to an Indiana consumer for last half shipment and a northern Indiana melter in Toledo territory is still in the market for 2,000 tons of northern foundry iron.

As far as open quotations are concerned, southern prices are unchanged at from $10.50 to $11, Birmingham basis, for No. 2 foundry, including both Alabama and Tennessee makes for delivery from the present time through the second half. It is expected, however, that when some of the secret transactions that are being made today became known, lower prices will have been made to induce buying. Southern Ohio furnaces are holding at $13.50, Ironton, for No. 2 foundry, for the first half.

Buys More Basic

The Commonwealth Steel Co., of St. Louis, bought 3,000 tons additional northern basic iron in Chicago the latter part of last week. This is about the extent of pig iron buying in St. Louis, with the exception of a few car lots for quick shipment. At St. Louis, southern No. 2 is quoted from $10.50 to $11, Birmingham basis. Prices of northern iron are unchanged.

(*For complete prices see page* 984)

Chilean Ore

Coming From Properties of Bethlehem Steel Co.

Three cargoes of iron ore, aggregating approximately 20,000 tons, from the Chilean properties of the Bethlehem Steel Co., now are en route from Cruz Grande to Philadelphia. These will be the first cargo lots of Chilean ore ever brought into this country. The shipment is being made by way of the Panama canal and the freight rate fixed at wild charter is 15s 6d. This rate, applying only to the particular shipment, is 3s higher than the figure at which the Bethlehem Steel Co. recently closed with Swedish steamship interests on a contract covering transportation of ore between Chile and the United States for a term of years. The third cargo of the season of Wabana, Newfoundland, ore, amounting to about 7,000 tons, also is en route to Philadelphia. This shipment still represents delivery against orders carried over from last year. The east is practically bare of ore sales, either domestic or foreign, though some negotiations continue.

The Lake Superior iron ore market drags and very few sales were made during the past week. Regular prices are being adhered to except in the case of low grade ores.

Little Activity in Alloys

Buying of ferro-manganese in eastern districts remains very limited. Carloads are the usual transactions. Several buyers who are not well covered ahead, are holding off from closing in the belief that there is nothing to be gained by acting at this time. Prices are unchanged at $38, seaboard. Other alloys are quiet.

Pittsburgh Alloys Quiet

The alloy market at Pittsburgh shows no change in position. Some inquiry for small lots is reported, but there is no snap to buying. Quotations are unchanged.

Buyers Would Like to Contract

In the Cleveland district, manufacturers of nuts and bolts report the increased disposition of buyers to contract, but the manufacturers are not willing to do so at present low prices.

Nut and Rivet Plants Not Active

Manufacturers of nuts, bolts and rivets in the Pittsburgh district are not operating plants at much more than 50 per cent capacity. Specifications are coming out slowly, and prices are irregular and uncertain. Prevailing rivet quotations are being shaded when attractive tonnages are involved.

Sheets in Better Demand

Large Order Placed by a Cleveland Concern —Still Cutting Prices

Some large buyers of sheets are showing a desire to contract as soon as possible. A large Cleveland consumer which caters to the automobile trade has closed for 8,000 tons of sheets with the American Sheet & Tin Plate Co. Considerable other business is pending.

Better Specifications

One large manufacturer of sheets in the Cincinnati district reports better specifications during the past week with new orders holding their own. Other mills, however, report, a very dull business with specifications low and new contracts at a minimum. Prices in surrounding territories are lower than those in the Cincinnati district. Black sheets No. 28 gage are quoted at from 1.90c to 2c, galvanized No. 28 at from 2.85c to 2.95c, and black annealed No. 10 at 1.55c, all Cincinnati basis.

Sheets Still Weak at Chicago

Sheets fail to feel the general uplift in finished steel in the Chicago market and apparently are the weakest product. Although quotations remain at 1.98c to 2.03c and 2.98c to 3.03c, Chicago, on No. 28 gage black and galvanized, respectively, considerable tonnage appears to be moving at $1 per ton less than these minimums. This is more easily obtained on galvanized than upon black sheets, in view of the low price of spelter.

Sheets Still Low at Pittsburgh

Although consumers are showing more interest in future requirements, there is no actual change in the market for steel sheets in western Pennsylvania and eastern Ohio. Several prominent buyers have opened quiet negotiations for fairly heavy tonnages, but mill managers have refused to sell for deliveries desired at prevailing prices. No. 28 gage galvanized sheets are quotable at 2.80c; No. 28 gage black at 1.85c, with some tonnage going at 1.80c, and No. 10 blue annealed products at 1.35c. Mill operations are unchanged.

East Stands Against Shading

A firm stand against shading a minimum of 1.50c, Philadelphia, or 1.35c, Pittsburgh, on No. 10 gage blue annealed, is being taken by eastern Pennsylvania sheet makers. Buyers unsuccessfully have been trying to develop $1 lower. Small orders are being taken at 1.55c, Philadelphia, or 1.40c, Pittsburgh. The eastern market remains narrow, as immediate requirements only are being covered largely. Better buying for the last half is expected soon. Operations in the east are lighter, the Alan Wood Iron & Steel Co. having taken off two mills. Eastern makers recently figured on large inquiries for heavy sheets from automobile manufacturers in Ohio.

Semi-Finished Dull

There is no life to the market for semi-finished products at Pittsburgh or in the valleys. Attempts to obtain billets at less than $20, mill, have been unsuccessful, but no trace of sales at any figure can be found. Sheet bars are held at $21, mill. Wire rods are quiet; they are listed at $26, Pittsburgh.

Plant Closed at Ashland

The Ashland Steel Co., Ashland, Ky., has closed its plant temporarily because of quiet conditions and lack of orders. Activities will be resumed about June 1. As a consequence wire rods and billets are unchanged in prices at $26.50, Ashland, for the former and $20.50, Ashland, for the latter.

No Eastern Billet Business

Practically no inquiry or new business of consequence in billets is coming out in the eastern Pennsylvania market. Leading makers report new bookings in May have been practically nominal. Specifications against running contracts are keeping the mills in operation. For rolling steel, $22.40, Philadelphia, or $20, Pittsburgh, seems minimum. Forging billets are $4 to $5 higher.

More Ovens Blown Out

In Spite of Reduced Production, Prices Are Very Irregular

Coke ovens were blown out in wholesale lots last week, the *Connellsville Courier* reporting that operations were discontinued at more than 3,000 ovens. Indications are that output will be further reduced. Despite curtailment, prices appear to be weakening. Some of the more prominent operators continue to ask $2, ovens, for contract furnace coke, but it is understood some grades are being offered at as low as $1.75, ovens, for any delivery. Some standard fuel for spot shipment has been sold at that figure, and several consumers claim they can obtain coke of good quality at $1.75, ovens, for extended shipment. The *Courier*, for the week ending May 16, says production was 294,715 tons, a decrease of 17,385 tons, compared with the week before.

Sale at St. Louis

One local sales agent at St. Louis reports a sale of 2,000 tons of foundry coke to an Illinois concern last week. The inquiries for 30,000 tons and 10,000 tons of coke reported last week have not been closed nor withdrawn. Prices of Connellsville and Virginia grades are unchanged.

Pocahontas Coke Weaker

The coke market at Cincinnati is chiefly characterized by the request to withhold shipments. Sales during the past week have been very few and for small tonnages. Prices are unchanged in the Wise county and New River districts, but Pocahontas foundry coke is a little weaker at from $2.40 to $2.50, ovens. Furnace coke from that district can be had at from $1.90 to $2.40, ovens.

Eastern Furnaces Buying Coke

Another eastern consumer has closed on slightly less than 10,000 tons of prompt furnace coke at $1.80, Connellsville ovens. This purchase brings the total sales of prompt furnace coke to eastern Pennsylvania, New Jersey and Buffalo furnaces, within the past several weeks, to 40,000 to 50,000 tons, some of which has been reported previously. The prices ruling on most of this business was $1.75 to $1.80, ovens.

Tin Mills Busy

Tin plate mills, with few exceptions, continue to operate at practically maximum capacity, on contracts taken earlier in the season. Some new business is reported, and material is going at $3.30 for base size tins when desirable lots are involved, and some makers have shaded that figure.

Edgar S. Cook, president of the Warwick Iron Co., Pottstown, Pa., has returned from a foreign tour.

(*For complete prices see page* 984)

Implement Men Inquire

But Mills Are Slow About Making Contracts at Present Prices

Implement manufacturers in eastern Pennsylvania have made further moves to sound out the steel bar market and several of them now are figuring tentatively on half or full year contracts from July 1, calling for estimated requirements of 4,000 to 5,000 tons. Bar makers are slow to commit themselves on prices so far ahead owing to the present low stage. One of them, however, has been talking $1 advance for third quarter. There is not much new business in plain bars moving in eastern Pennsylvania and surrounding markets, but the demand for reinforcing bars is very fair. Bids went in this week on a small tonnage and will be taken May 27 on 800 tons of twisted bars, both for the Panama canal. A recent inquiry from Baltimore jobbers for 3,100 tons of twisted bars is believed to be for a large Coca-Cola warehouse in that city. Further cases this week are noted where makers refused offers of 1.10c, Pittsburgh, or 1.25c, Philadelphia, and the market seems firm at 1.30c, Philadelphia.

Few Foreign Bars in East

Steel merchants who have kept a close watch upon the records of the ports of New York and Philadelphia in recent months, state that practically no foreign steel bars have come in at these points. As previously reported, however, a fair tonnage of German bars recently was received by Boston jobbers. Some good-sized requirements for reinforcing bars are pending in the metropolitan district, but new business, on the whole, is light. Prices continue 1.31c, New York, or 1.15c, Pittsburgh.

Steel Bars Weaken at Pittsburgh

With the beginning of light buying at Pittsburgh, the steel bar market has manifested signs of slight weakness. Leading mills are asking 1.15c, but it is reported consumers have been offered material at 1.12½c, or 50 cents a ton less than the general asking price, but such reports have not been fully verified. Compared with the market for steel plates, that for steel bars is slightly stronger. No particularly heavy buying has taken place.

The market for iron bars in the Pittsburgh district continues quiet, and the prevailing price is nominal. Local mills are asking 1.30c and 1.35c, but tonnage can be laid down there at $1 and $2 a ton less than minimum market quotation.

Steel Bars Move Better

A number of producers of steel bars in Chicago have felt largely increased interest on the part of buyers and inquiries, orders and specifications the past week have been much heavier than for several weeks past, in fact, practically double the total of the preceding week. As yet, the volume of business is not sufficient to call for an increase in production nor is it sufficient to affect quotations. Prices remain 1.28c to 1.33c, Chicago.

Bars No Stronger

The market for iron bars in Chicago continues to be moving fairly well, and while specifications are somewhat better than has been the case and inquiries and orders are somewhat improved, deals are almost entirely in small tonnages and for immediate delivery. Apparently users are buying only for the more pressing needs and are not willing to take more than they can consume within a short time. Mills are operating almost entirely on current business, as tonnage on mill books is practically exhausted. Expectations that rolling operations would be curtailed shortly have not yet been realized, as sufficient business has been coming in from week to week to maintain rolling schedules. We quote iron bars 1.10c to 1.12½c, Chicago.

In the Cleveland district a number of manufacturers of agricultural implements have come into the market to see what could be done, but no contracts have been made. In that district 1.15c, Pittsburgh, seems to be the minimum quotation.

Specifications in the Buffalo district have shown an improvement over the first two weeks of the present month. Fair tonnages are being booked by mills and agencies. The ruling price is 1.15c, base. So far, nothing better has appeared, despite rumors that 1.12c and 1.10c, base, have been obtainable.

Lower Reports at Philadelphia

The eastern trade hears reports that 1.15c, Philadelphia has been done on common bar iron, but these statements are not fully verified. The inside price heretofore has been about 1.20c, Philadelphia, and that upon the desirable orders. New business among eastern Pennsylvania mills remains small and some of these plants are running on only day-to-day orders.

The plant of the Jansen Steel & Iron Co., Columbia, Pa., manufacturer of bar iron, was closed down this week on account of the poor trade conditions.

Hoops, Bands and Shafting Quiet

The market for hoops, bands and cold rolled shafting at Pittsburgh continues dull and prices are regarded as nominal. Shafting is selling as low as 66 per cent off list. Hoops are named at 1.25c and bands at 1.15c.

Prices Shaded

On Oil Country Goods—Philadelphia Co. Inquiry

Reports of new cards on oil country goods having been issued were heard in the trade early this week, but no trace of any change in published quotations can be found. It is understood, however, that discounts for oil country goods have showed irregularity in some sections. The Philadelphia Co. has entered the market for 12,000 feet of 10¾ inch O. D. plain end steel pipe for a gas line, equivalent to about 220 tons. Standard iron and steel pipe discounts are unchanged. Demand for boiler tubes is light, and prices irregular.

Wire Prices Shaded

Despite moderate improvement in specifications from the west, wire products show price weakness in the Pittsburgh district. The $1.60 price for nails is nominal; material is selling at $1 and even $2 a ton under that figure. Consumers still refuse to buy for anything but prompt delivery.

Chicago Warehouses Busy

Warehouse business continues to hold up well in Chicago, and no diminution in demand has been noted. With building operations more or less interfered with by strikes, warehousemen have found their business somewhat curtailed for the season, but in spite of this, business is increasing week by week. Quotations on shapes, plates and bars from store remain at the same level as has been prevailing, but No. 28 black and galvanized sheets have been reduced from 2.55c and 3.55c to 2.45c to 3.45c, Chicago, to meet lower quotations by sheet mills.

The Capewell Horse Nail Co., Hartford, Conn., has let the contract for a new steel storage building.

(*For complete prices see page* 984)

Bids on Cast Iron Tubes

Received in New York—Lowest Tender is Over Twelve Million Dollars

The low bid for constructing four cast iron tubes in two tunnels under the East river, between lower Manhattan and Brooklyn, has been submitted by Booth & Flynn, Ltd., of Pittsburgh, and the O'Rourke Engineering Construction Co., of New York, bidding in partnership. Their tender was $12,461,000. These tubes, as previously reported, will require about 80,000 tons of cast iron segments, and a number of foundry companies have been figuring with contractors to furnish this material. R. D. Wood & Co. are low bidders on 2,500 tons of 30-inch pipe for Perth Amboy, N. J. There is a fair run of small pipe orders in the list, but the large lots are lacking. Prices remain soft.

Cast iron pipe in the Chicago district appears to be somewhat more active than has been the case for several weeks. Contractors are taking small lots more liberally than before and this tonnage amounts to a respectable total, which is entirely satisfactory to foundries. The United States Cast Iron Pipe & Foundry Co. has been awarded 1,000 tons at St. Louis, part of which is in larger sizes so much desired by foundries. Transcona, Man., will let contracts for 1,470 tons May 30, and Sioux City, Ia., will let 200 tons at the same time. Bids on 750 tons of pipe for high pressure have just been opened at Cincinnati and it will be awarded shortly.

Plate Mills

Operating at About Half Capacity in East

The plate mills of eastern Pennsylvania now are running at about 50 to 60 per cent of capacity, and new business, made up chiefly of small lots, is around that basis. The run of the market still brings 1.30c, Philadelphia, or 1.15c Pittsburgh, but desirable orders are shading this about $1. The Alan Wood Iron & Steel Co. recently took a tonnage of plates for New York elevated work from the McClintic-Marshall Co. The Seaboard Air Line is inquiring for the tank steel for 25 locomotives and the Chesapeake & Ohio has offered some small lots.

Small Orders at New York

Some good-sized plate requirements continue to be presented by elevated and subway work in New York City and these have been going to producers both in the east and the west. Other than these tonnages, the metropolitan plate market consists of small odds and ends. The full range of prices remains 1.26c to 1.31c, New York.

Plates Low at Pittsburgh

Manufacturers of heavy steel products in the Pittsburgh district returned from the American Iron and Steel Institute meeting at New York more hopeful that the long looked for change in market conditions soon would come. Inquiry for steel plates is somewhat better, but material continues to go at 1.10c, and actual orders are no better.

Plates Remain Weak

Of the finished steel products, plates appear to have been affected least in the Chicago market by the present movement, and in the absence of increased car building less change is noticed than in other steel products. Steel plates are still quotable in this market at 1.28c to 1.33c, Chicago.

Scrap Buyers

Show More Interest in Some Centers, But Dullness General

Some consumers in eastern Pennsylvania are showing more interest in their scrap needs and the tone of the market continues a little better, but the volume of trade still lags. No further sales of heavy steel have resulted. Two consumers of wrought pipe have been in the market and have taken some lots at $10.75 and $11, delivered, with some reports that lower was done. The heavy cast market has a wide range of from $12 to $13, delivered, depending upon individual conditions. Car wheels and No. 1 forge are lower.

Dull Market at Metropolis

The scrap market at New York City and vicinity remains listless. Only small orders are being placed by consumers and buying by brokers against old contracts is the principal activity. Prices continue to weaken and foundry materials are lower this week. Wrought scrap is very dull, due to poor business conditions among the iron mills. One of the Columbia, Pa., plants has shut down.

There is a tendency towards a better demand in the Buffalo old material market, otherwise conditions remain about the same as reported a week ago.

Pittsburgh Scrap in Dumps

The old materials market in the Pittsburgh district, in the dumps for several months, shows no actual signs of improvement. Melters are refusing to pay $12 for heavy melting steel, but some dealers continue to regard $12.50 as the market price for this grade. Demand for other grades of scrap is decidedly light, and quotations continue to reflect weakness.

Very Unfavorable Conditions

At Cleveland, dearth of transactions has resulted in a largely nominal level for scrap quotations. All rolling mills are refusing shipments of old material; foundry trade is exceedingly light and supplies of cast scrap are large. One of the main users of melting scrap is accepting but one or two cars of steel a week from each dealer. Taking all in all, about the same situation prevails as in November, except that now there are few signs of better times in the near future, while in November there were plenty of indications of a nearby buying movement. Despite the obvious curtailment of scrap supplies through decreased mill operations, railroad and country offerings are swelling stocks in yards.

Dull at Cincinnati

Demand for old material in the Cincinnati market remains at a minimum. Users in that territory have sufficient supplies to run them for a long time or else are buying in small lots only to fill requirements from week to week. Conditions are essentially in the hands of buyers, as separate quotations are made on each transaction, regardless of a general level of prices. Machine shop turnings picked up a little during the past week and were selling at from $4.50 to $4.75 per net ton. This was only a temporary spurt, however, as this material today shows signs of becoming inactive again.

Chicago Scrap Stationary

In an almost entire absence of demand for scrap in the Chicago market, prices remain nominally the same as a week ago. It is entirely a buyers' market and prices are whatever a buyer and seller can agree on, regardless of quotations. Brokers have almost ceased dealing among themselves and consumers are taking practically nothing, leaving the market in an absolutely negative position.

Railroad offerings continue to be made liberally and at present almost 20,000 tons are before the market. The Baltimore & Ohio is offering 12,-

(*For complete prices see page* 984)

000 tons of which 3,000 tons are long steel rails; the Rock Island offers 4,000 tons, of which 600 tons are long steel rails; the Grand Trunk, 1,900 tons; the Illinois Central, 300 tons; the Monon, 600 tons; the Mather Stock Car Co., 100 tons, and the Standard Oil Co., 870 tons.

At St. Louis, the steel mills are asking for steel scrap to some little extent, but all other lines are dull. Dealers believe the bottom has been reached in prices, however, and that it will be a waiting game for some time. Railroad lists are out today as follows: Illinois Central, 3,500 tons; Frisco, 2,000 tons; M., K. & T., 300 tons, all of which will be closed this week.

Inquiry for Structurals

In Cleveland District is for 20,000 Tons, Sent Out by Brown Hoisting Machinery Co.

The largest inquiry which has been pending in the Cleveland district for a long time has been sent out by the Brown Hoisting Machinery Co., for 20,000 tons of structural material. The company states that it is unable to give any particulars concerning this business. The fire in the flats, Cleveland, Monday night, caused a loss of over a million dollars and resulted in serious damage to the Central Viaduct, the Nickel Plate bridge, the Big Four bridge and burned about 40 cars belonging to Ringling Bros. circus. No estimate has been made as to the amount of steel which will be required to repair the damaged bridges.

The lowest bidder on the general contract for the new barn of the Cleveland Railway Co., calling for 1,600 tons of steel, was Roderick D. Grant.

Better Lettings in West

Considerable increase has been noted in the number and tonnage of structural lettings in the Chicago district the past week, a total of over 7,000 tons having been closed. The far west and south, as has been the case largely the present spring, have taken the greater portion of this and only a small tonnage goes to railroads, the greater portion being for industrial and business structures.

Shape Market More Active

The undercurrent of improved sentiment which has been felt in the Chicago district for a fortnight has resulted in enlarged business in steel structural shapes and makers have experienced an increase in business which has been most gratifying except for the fact that they fear it may not prove lasting. Specifications for immediate delivery have increased materially and there is a much greater inquiry than has been felt for several weeks past. Shapes still are obtainable at 1.28c to 1.33c, Chicago.

Pittsburgh manufacturers of structural shapes report that inquiry is somewhat better, but prices show no improvement. Shapes are being held at 1.15c, but in adjacent districts material is going at 1.10c, and reports of the general asking price being shaded for delivery in the Pittsburgh territory are heard. Structural undertakings throughout the country have helped to improve the situation to some extent.

At Buffalo, no orders for large tonnages of structural material have appeared as yet to really test the market, but the prevailing price seems set for the present at 1.15c, base. There has been an improvement in specifications and inquiry for moderate tonnages.

Small Orders at Philadelphia

Structural shape tonnage from the Philadelphia and surrounding districts has dropped to only small current orders at present. Sizeable lots are rare but the mills are getting fair specifications against recent bookings. On the present small offerings, 1.30c, Philadelphia, or 1.15c, Pittsburgh, prevails. Larger sized orders undoubtedly would be done at $1 less. Some new bridge work for eastern Pennsylvania delivery is out.

More Subway Work Offered

Inquiries for three additional sections of New York subway extensions have been issued for bids and these will call for approximately 12,000 tons of steel work. Fabricated orders in the metropolis and vicinity, have been very light, the past week, and the pending tonnage, apart from the subway work, is not heavy. New inquiries from New York City are especially few and the architects and engineers are reported to have not much work on their boards. Plain material prices rule from 1.26c to 1.31c, New York, and are determined by the attractiveness of the individual order.

STEEL CONTRACTS AWARDED.

Meier & Frank building, Portland, Ore., 3,500 tons, to the Northwest Steel Co., Portland, Ore.

W. L. DeWolf & Co., Chicago, building, Aberdeen and West Adams street, Chicago, 827 tons, to the Gage Structural Steel Co., Chicago.

The Texas Co. building, Houston, Tex., 1,433 tons, to the Houston Structural Steel Co.

Chicago, Milwaukee & St. Paul Ry. Co., C 3 and C 4 girders, 478 tons, to the Wisconsin Bridge & Iron Co.

Pantages Theater building, Seattle, Wash., 292 tons, to Jos. T. Ryerson & Sons.

Gordon Creek viaduct extension, Utah Railway Co., Helper, Utah, 255 tons, to American Bridge Co.

Bridge work for Western Maryland railroad, 1,000 tons, awarded the American Bridge Co.

Addition to Seneca Iron & Steel Co.'s plant, Buffalo, awarded to Lackawanna Steel Co., 400 tons.

STEEL CONTRACTS PENDING.

Seven span, riveted truss bridge across Schuylkill river at Earnest, Pa., for Pennsylvania railroad, about 1,000 tons; bids being taken.

Richardson department store building, Atlanta, Ga., 1,200 tons; bids taken.

Model Theater, Buffalo, Martin Miller, architect, bids go in in week, 100 tons structural.

Seneca street viaduct, Buffalo, Grade Crossing Commission Work, strengthening floor, Stroebel Steel Construction Co., Chicago, low bidder, 400 to 500 tons structural.

Steel work for Y. M. C. A. building, Brooklyn, 3,000 to 4,000 tons. Bids being taken by the general contractor, The Whitman Co., New York; Bethlehem sections specified.

St. Mary's hospital, Hoboken, N. J., 500 tons, bids taken.

Store and office building for Texas Co., Huston, Texas, 500 to 1,000 tons. Steel bids asked for June 1.

High school, Montclair, N. J., tonnage not estimated. Bids being taken.

Section No. 7 of the Seventh avenue subway line, estimated about 10,000 tons, bids to be taken June 12.

Section No. 1 of the Eastern Parkway subway, Brooklyn, steel tonnage estimated at about 7,500 tons. Bids to be taken June 16.

Connecting loop for subway extensions at Forty-second street, New York City, 450 tons. General contract awarded to the Holbrook, Cabot & Rollins Corporation.

Tubes under East river for New York subway extensions, 2,570 tons of steel and 80,000 tons of cast iron segments. Booth & Flynn, Ltd., and the O'Rourke Engineering Construction Co., low bidders.

The Public Service Commission has awarded to the United States Realty & Improvement Co. the contract for the construction of section No. 2 of the Broadway-Fourth avenue line, to require 5,020 tons of structural steel.

Coke Rate Stands

Washington, May 27. (By wire.)—The Interstate Commerce Commission, in an opinion announced this morning, dismisses the complaint of the Wickwire Steel Co. and other Buffalo district furnace interests against the coke rate, $1.85 per ton from Connellsville to Buffalo. The case was once before decided. The Commission's holding that the rate was not unreasonable was reopened when the complainants alleged errors in the original decision. The Commission says since no new evidence has been offered, there is no reason to depart from the first decision.

(For complete prices see page 984)

Heavy Car Steel Orders

Placed With the Carnegie Steel Co.—Rails for Export Booked by Steel Corporation

Car material orders, totaling about 50,000 tons, and covering recent contracts taken by builders, have been placed with the Carnegie Steel Co. by the Pressed Steel Car Co. and the Standard Steel Car Co., within the past few days. The opinion now is expressed in the equipment market that the Supreme Court decision in upsetting the Interstate Commerce Commission's ruling on "tap line" railroads, has cleared the air for the settlement of the freight advance case. As the Commerce Commission had considered the cutting off of freight allowances made by through lines to industrial lines, as a means of providing increased revenue for the former, the situation that now obtains is more favorable for the granting of straight rate advances to produce relief, it is thought. Car orders of the week have been small. A report that the Mobile & Ohio railroad has bought cars refers to a purchase made for that road by the Southern railway some weeks ago and previously reported. The Great Northern railroad is considering the building of a block of cars in its own shops, but has not yet determined to do so.

The Steel Corporation has booked contracts for about 35,000 tons of rails for export to British colonies. The Pennsylvania railroad still is conferring with rail makers to fix the typical cost of its new rail specifications, as shown by recent test rollings by the Pennsylvania Steel Co. and the Cambria Steel Co. The matter has not yet been adjusted but now is expected to be done shortly and further orders for the season's requirements of the Pennsylvania system will be distributed then. The Seaboard Air Line is about to close on its inquiry for 17,000 tons. There is considerable buying of girder rails in small lots and the aggregate tonnage makes a fair showing. The Jones & Laughlin Steel Co. has taken 1,000 kegs of standard spikes from the government for shipment to Panama.

Mills rolling standard and light rails in the Pittsburgh district advise that specifications thus far this month are equal to those received in the corresponding period in April. No attractive orders are being placed, however.

CAR AND LOCOMOTIVE ORDERS.

The Cuban Central Railways, Ltd., have ordered 13 superheater ten-wheel passenger locomotives, one superheater eight-wheel passenger locomotive and one consolidation freight locomotive, from the American Locomotive Co.

The Kansas City Southern railroad has ordered 100 Hart ballast cars from the American Car & Foundry Co.

The Chicago Northwestern railroad has placed 250 Hart ballast cars, in addition to 3,000 box cars, with the American Car & Foundry Co.

The Missouri, Kansas & Texas railroad has ordered 200 Rogers ballast cars from the American Car & Foundry Co.

The American Milling Co. has placed six general passenger service and one flat car with the Pressed Steel Car Co.

The Southern Pacific railroad is in the market for 46 motor passenger cars.

The Seaboard Air Line is in the market for 25 locomotives and also is figuring on 400 box cars and 45 coaches.

The Union Pacific railroad has awarded 107 coaches of assorted types to the Pullman Co.

Indian Rails

Will be Imported—Very Low Manufacturing Cost

New York, May 25.—Indian rails will invade the western coast of the United States for the first time within the next two weeks, when the initial cargo produced for buyers in this country by the Tata Iron & Steel Co. at Sakchi will be received.

Official announcement of this fact was made before the American Iron and Steel Institute at New York last week by Chas. P. Perin, of New York City, consulting engineer of the India company, who has just returned from a trip to the works. Mr. Perin stated that the reduction of the tariff on rails has helped considerably to enable his company to ship rails to this country, but he also outlined the astoundingly low manufacturing and operating costs of the Tata company. The 7,000 native laborers of the company receive 7 and 8 cents wages a day. Coke can be manufactured at $1 a ton and iron ore is laid down in the stock house at a remarkably low cost per unit.

Belgian rail makers also are selling some rails in this country, a lot of 1,000 tons of girder sections recently having been taken by traction interests at San Antonio, Texas.

Foundry Iron Sale

Pittsburgh, May 27. (By wire.)—A Pittsburgh consumer has closed for 500 tons of No. 3 foundry iron at $13.65, delivered. The price would net the furnace $13.

(*For complete prices see page* 984)

METAL MARKETS

New York

May 26.

Copper. — Leading copper producers now are asking 14.25c, delivered 30 days, for electrolytic and some business is being done at this price. Demand, however, is not sufficient to sustain these interests in their efforts to firm up the market and lower prices continue to be heard. At least one sale was reported during the week at 14.15c, delivered 30 days, and 14.20c is heard of occasionally. On a wholesale contract basis, electrolytic is quoted at 13.95c to 14.10c, cash. Prime casting is quoted at 13.87½c, cash, with demand dull. Prime lake is quoted at 14.25c to 14.37½c, cash, for good merchantable brands. The lake market is rather weak as a result of the increased output at the mines. The standard market is steady. Today's close on the London exchange was £63 3s 9d for spot and £63 16s 3d for three months.

Tin.—For the first time in a long while consumers are showing interest in their tin requirements and consequently the market has a better tone. Low prices continue to prevail and today 33.25c to 33.30c is asked for spot, May and June; 33.37½c for July and 33.50c for August. The London market is quiet today; during the week fluctuations have been within narrow limits. Today's London close was £150 for spot and £152 for three months.

Spelter.—This metal is held somewhat lower than last week and consumers can get all they want at 5.10c, New York, in 50-ton lots or larger. Demand is small.

Antimony.—Cookson's antimony, by reason of fresh shipments which have relieved the comparative scarcity, is held somewhat lower; inferior brands also have weakened for the same reason. Hallett's and United States, however, are unchanged. Demand is very dull. Prices on large lots, duty paid, New York, now are as follows: Cookson's 7.12½c to 7.25c; Hallett's, 7c to 7.25c; United States 7c to 7.12½c; other brands 5.75c to 5.87½c.

Chicago

May 26.

Comparatively small business is being done in new metals and prices are little different from those prevailing last week. Spelter and zinc remain the same while lead is a shade higher and tin about 1 cent lower.

We quote dealers' selling prices f. o. b. Chicago, as follows:

Lake copper, carload lots, 14.25c; casting, 14.25c; smaller lots, ¼c to ¾c higher. Spelter, car lots, 5.05c; lead, desilverized, 3.90c; sheet zinc, $7.00, f. o. b. La Salle, in car lots of 600-pound casks; pig tin, 33.75c; Cookson's antimony, 7.25c; other grades, 6c.

In old metals practically no trading is being done and both dealers and consumers are playing a waiting game. Some small tonnages are being moved but without effect on quotations, which are almost nominal. No. 1 pewter, block tin pipe and tin foil range slightly lower than was the case a week ago.

We quote dealers' selling prices f. o. b. Chicago, as follows:

Copper wire, crucible shapes, 12.75c; copper bottoms, 12.00c; heavy red brass, 11.75c; heavy yellow brass, 9.00c; No. 1 red brass borings, 10.50c; No. 1 yellow brass borings, 8.00c; brass clippings, 9.25c; lead pipe, 3.60c; zinc scrap, 4.00c; tea lead, 3.50c; No. 1 aluminum, 14.00c; No. 1 pewter, 22.50c; block tin pipe, 30.50c; tin foil, 27.00c; linotype dross 3c; electrotype dross, 3c; stereotype plates, 4.25c; stereotype dross, 3c.

Dam Blocking Business Doomed

But No One Makes Very Definite Predictions—Record Breaking Attendance at Meeting of American Iron and Steel Institute

Not only hopes, but expectations, as Judge Gary expressed it, now are entertained by iron and steel manufacturers for a revival of prosperity in this country in the not distant future. Up to this moment, business has not shown any genuine or appreciable improvement, but sentiment now is being heartened and refreshed by the increased soundness of underlying conditions and by the conviction that deferred buying long-continued, soon must burst through the dam of lost confidence that now obstructs it. There is no disposition of iron and steel makers to be strongly optimistic under present conditions. The unfavorable factors still are receiving, as they have received, full realization. That there remain deterrent and discouraging sides to the situation, needs no emphasis. Firm faith in the future, accordingly, is being tempered with feelings of conservation and reserve concerning the period that must elapse before active conditions are restored.

"UNCLE JOE"
Winning friends for his pet proposition

From a commercial aspect, these conclusions stand forth prominently in the judgments, both public and private, expressed in the largest assemblage of the iron and steel industry ever held in this country—the sixth general meeting of the American Iron and Steel Institute, at the Waldorf-Astoria, New York City, Friday, May 22.

JUDGE GARY
Telling everybody to be good

The meeting broke all records in attendance, surpassing the Chicago session last June by about a score. The registration was approximately 500 and this number was exceeded at the banquet. The technical papers and discussions composing the regular program were of high merit, some of them of extraordinary excellence, and their presentation received the most interested attention.

Judge Gary's Address.

President Gary, in his annual address, bespoke a future confidence in the justice and good sense of the American people eventually to give a fair chance to business good and small and expressed the belief that sentiment against continued agitation now is changing for the better. He said in part:

"In times of prosperity it is very easy for us to be generous in our treatment of all the questions which are presented to us for consideration and determination. In such times, it is not difficult for us to be generous to our employes and towards one another. If our mills are running at full capacity and our earnings large, and our balances in the bank entirely satisfactory, it is natural for us to pay large wages, and to deal kindly towards each other, avoiding doing anything that is unfair, giving every opportunity to inspect our mills and to know what we are doing to secure the greatest economies, and, in fact, to permit each other to know the names of our customers and even the bookings which we have; and there have been times when this generosity has been shown by those who are connected with this great industry, in a marked degree. But when the orders on our books are small and the prices are low, and the demand much below capacity to supply, we are all more or less inclined to be selfish.

"Possibly some of us are forced to do everything we can to secure orders and to take care of our own interests, regardless of the rights and interests of our competitors in business, and, also, sometimes, without regard to our obligations to our employes. Without intending to emphasize the conditions which obtain at

C. M. SCHWAB
Told the banqueters a story that hit the spot

the present time, I would be less than frank and truthful if I failed to admit that business is not as good as we would like to have it.

"I would like to say just what is in

WILLIS KING,
Making a few "Impromptu" remarks

my mind concerning this subject, but perhaps it is unnecessary. I said six months ago, at our semi-annual meeting, that, in my opinion, we were approaching the dawn of prosperity. Well, gentlemen, don't forget that we are six months nearer the dawn. (Applause and laughter.)

"But in times like these, I ask you to consider not only the propriety, but the necessity—and, more than that, the pleasure of being fair, reasonable and generous in our treatment of our employes and our treatment of one another. It is not necessary at this time to speak of being generous to our customers, for they are taking care of themselves. (Laughter.) But it is necessary to be very considerate of each other, and it is not only our duty, as members of a fraternity who have established a reputation for fair and honorable dealing, to be very careful not to do anything that is unjust towards each other, but it pays in dollars and cents to occupy and to pursue that course. There is no one man or company so capable, intellectually or otherwise, that he or it can afford to ignore the rights of others.

"I am dealing in generalities and without any intention to refer to any individual or any company. We are all on the same basis. We are all trying to take care of ourselves but we should all, at the same time, have a disposition to try and help one another.

There are some favorable things to be considered. In the first place, as is our habit, we point to the crops of the year. They are something that cannot be taken away from us, even by the politicians. Crops are growing. We are going to have an abundance this year, and they will have their influence on the business conditions of this country. We shall see improvement. This country is just as big as it ever was; it is growing just as fast. It is rich and it is bound to be prosperous. Depressions

W. U. FOLLANSBEE,
Relieved himself and won unanimous approval by giving his opinion about some things in Washington

are temporary. If we are careful of our business, if we husband our resources, if we have patience, courage, persistence, we will come out in the end all right.

"But there is another thing I believe more important. As I read the signs of the day, there is a well developed sentiment throughout this country in favor of giving business—even big business—a fair chance. (Applause.)

"The man in office, or the man accepting candidacy for office, who will have the disposition and the courage to stand up and declare that it is time for the people of this country to realize there can be no real happiness or comfort or prosperity except on a foundation of material growth and prosperity, if he is fortified by a reputation for ability and honesty, will be most popular. I believe that the tendency which has been shown against business, which has, perhaps, had its influence, is radically changing. I have no disposition to minimize the efforts of any man who talks of moral growth and moral strength, but nevertheless that, without material prosperity, will be unavailable; and I believe we shall soon see much better conditions including even the legislation of the country." (Applause.)

New Talent at Banquet

The addresses at the banquet Friday evening were marked by the demonstration of much new after-dinner talent among the members of the institute. A number of manufacturers who hitherto had not responded upon such occasions were called upon for "impromptu" remarks. About 500 diners were present.

In a ringing address, Frank Baackes, of Chicago, general sales manager of the American Steel & Wire Co., handled the commercial

JAMES A. FARRELL,
Tells of his faith in the future

situation in the iron and steel industry with characteristic and straightforward observations.

"I am much impressed by the progress the steel industry is making

in technical, welfare and other lines. I am more impressed, however, in the little progress that is being made in the commercial end—and I have the honor to represent the commercial end," he said. "Every time we have a depression, the commercial end loses its head. Depressions are bound to come. We can't control them nor can we control the polictichians or legislation. There is no reason, however, why what we sell we should sell at a lack of profit. Then, we allow those fellows at Washington, who do not know anything about business, to disturb us. If they did know anything about business, they wouldn't be in Washington, but would be out for themselves. Let us be up and doing, somehow, the same as those fellows at Washington. Don't let us blame our shortcomings on some one else. We are in the habit of believing the men we are going to sell to, rather than ourselves. The man we sell to is going to do you if you can, even if he is your best friend. I have observed that the buyer, even if the seller is his best friend, tries to make the latter work for him. Why do we believe our enemies instead of our friends? My competitor does not believe me and I do not believe him.

"Conditions are not bad; they might

FRANK BAACKES,
Winning applause by giving his ideas of salesmanship

be worse. We still have something to do. This great United States can stand almost anything and will continue to do business. The country is liquidated to a standstill and we shall see business come in bye and bye. When it comes, I hope we will have sense enough not to book ourselves up for a year ahead at profitless prices and to work for the other fellow during that time. Let us aim to get a good, fair price for our goods. There is no law in the country to prevent us from getting it. Let us show the manufacturing end of the business that we can do as much as it can by making some money. Let's get a living price and remain respectful to ourselves by not being a fool."

Mr. Baackes' remarks evoked great applause.

British Institute Sends Greetings

President James A. Farrell, of the Steel Corporation, just returning from Europe, brought a message of good will to the American Iron and Steel Institute from the Iron and Steel Institute adopted at its recent session

G. M. VERITY,
Who struck a sympathetic note in his discussion of some steel problems

in London, which he attended. At the suggestion of Judge Gary, the diners, by a rising vote, decided to reciprocate this courtesy by sending a similar message of cordial feeling.

Wm. U. Follansbee, of the Follansbee Bros. Co., Pittsburgh, in a humorous way, surveyed the present tribulations of sheet and tin plate manufacturers. He referred to the heavy imports of tin plate under the new tariff act. The only factory he was able to find was working full time today was the "conversation factory at Washington," he said.

Geo. M. Verity, president of the American Rolling Mill Co., Middletown, O., said that the dam now obstructing the business stream could only be of limited size and that it had reached about as high as it could go. He expected it to soon break down and a flood of business be released. He expressed the opinion that the institute should exert its influence to bring about more staple and satisfactory labor conditions in the iron and steel industry and to promote a better understanding between

JOHN A. TOPPING,
Reading T. J. Bray's paper on "The Investment Factor in Costs"

employer and employe. Severn P. Ker, president of the Sharon Steel Hoop Co., responded in a similar fashion regarding the business situation and said that things had reached about as low a stage as they could go. He said the dam delaying business now was very high, but that it could not withstand the pressure behind it for long. There was some hope in the situation, he thought, in the fact that congress will soon adjourn and that the present members will go home and seek reelection. He believed these congressmen would make little headway when they came to place their political theories against the empty dinner bucket.

J. H. Plummer, president of the Dominion Iron & Steel Co., Sydney, N. S., paid a tribute to the skill and resourcefulness of the American iron and steel makers and presented the kind regards of his Canadian colleagues. Other speakers at the banquet were Chas. P. Perin, New York, who described iron and steel manufacturing conditions in India, in which he is directly interested; Attorney Jas. H. Hoyt, Cleveland, and Hugh Kennedy, Rogers Brown Iron Co., Buffalo, Chas. M. Schwab and Willis L. King, also were called upon for short talks.

The leading programmed address

at the banquet was that upon "The Present Scope of Welfare Work in the Iron and Steel Industry," by Dr. Thos. Darlington, secretary of the welfare committee of the American Iron and Steel Institute. This proved to be a most able presentation and covered every phase of the welfare work that has been accomplished in the industry and the scientific reasons for it. Dr. Darlington's remarks were illustrated by numerous slides demonstrating present-day conditions and showing clearly the great strides the iron and steel industry has been making in promoting the health, comfort and general well-being of its employes. Sydney McCurdy, chief surgeon of the Youngstown Sheet & Tube Co., presented a discussion of Dr. Darlington's paper.

Several of the papers presented at the meeting are published in full or in abstract elsewhere in this issue, including the following: "American Blast Furnace Practice," by Hermann A. Brassert; "How Heat Treating Affects Wire," by John F. Tinsley; "The Investment Factor and Sales Policy," by Thomas J. Bray; "Progress in Steam Turbine Design," by Francis Hodginson, and "Recent Coke Oven Developments," by William H. Blauvelt. The remaining papers will be presented in subsequent issues of THE IRON TRADE REVIEW.

J. T. McCLEARY,
Noted for the knowledge he does not talk about

Officers Re-elected.

At the annual meeting of the board of directors of the institute, held Friday, the retiring officers for the ensuing year were re-elected. These are as follows: Elbert H. Gary, president; Powell Stackhouse, first vice president; Willis L. King, second vice president; Chas. M. Schwab, third vice president; Edward Bailey, treasurer and Jas. T. McCleary, secretary.

The committee on arrangements, consisting of Jas. A. Farrell, chairman, Edmund A. S. Clarke, John C. Maben, Chas. M. Schwab, John A. Topping and Frank S. Witherbee, was re-named and the matter of arranging the June meeting was left in the hands of this body for later recommendations. If proper arrangements can be made, it is very probable that the June meeting will be held at Birmingham.

A number of new members were admitted to the American Iron and Steel Institute at the meeting of the board of directors last week, and by recent letter ballot. The list follows:

Active Members.

Brooke Anderson, assistant department manager, American Steel & Wire Co., Chicago.

Richard E. Bebb, president, Massillon Rolling Mill Co., Massillon, O.

Ralph W. Clark, head salesman, New York office, Rogers, Brown & Co., 30 Church street, New York City.

Dwight H. Coble, secretary, H. C. Frick Coke Co., Pittsburgh.

W. H. Davey, general manager, Massillon Rolling Mill Co., Massillon, O.

James C. Davis, fourth vice president, American Steel Foundries, Chicago.

Henry F. Devens, general sales manager, Superior Steel Co., Carnegie, Pa.

Alfred W. Dodd, sales manager, the New Jersey Zinc Co., 55 Wall street, New York City.

Frederick J. Griffiths, general superintendent, Massillon Rolling Mill Co., Massillon, O.

Edwin W. Harrison, vice president, Superior Steel Co., Philadelphia.

Joseph F. Hedges, secretary and treasurer, Superior Steel Co., Carnegie, Pa.

Walter L. Kauffman, credit manager, the Youngstown Sheet & Tube Co., Youngstown, Ohio.

Frank P. Bassett, Pennsylvania Steel Co., Steelton, Pa.

W. E. Corne, sales manager, American Steel & Wire Co., 30 Church street, New York City.

Harry T. Harrison, chief engineer, Corrigan, McKinney & Co., Cleveland.

J. F. Lloyd, vice president, Weirton Steel Co., Weirton, W. Va.

John Alden Nichols, general superintendent, Corrigan, McKinney & Co., Cleveland.

Lloyd Noland, superintendent health department, Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

George P. Pilling, furnace manager, Standish, New York.

John C. Williams, assistant to president, Phillips Sheet & Tin Plate Co., Weirton, W. Va.

W. C. McKee, general superintendent, the Thomas Iron Co., Easton, Pa.

William P. Palmer, general superintendent, American Tube & Stamping Co., Bridgeport, Conn.

Gustav A. Reinhardt, Youngstown Sheet & Tube Co., Youngstown, O.

A. W. Vogt, chief statistician, United States Steel Corporation, 71 Broadway, New York City.

John J. Watson, general manager of sales, Phillips Sheet & Tin Plate Co., Weirton, W. Va.

Alexander Fielder Clarke, manager, Firth-Sterling Steel Co., McKeesport, Pa.

Samuel L. McCormick, secretary, Weirton Steel Co., Weirton, W. Va.

John Hart McAlarney, salesman, United States Steel Products Co., 30 Church street, New York City.

Richard Vincent McKay, superintendent blast furnaces, Pennsylvania Steel Co., Steelton, Pa.

John E. Perry, assistant to the president, Republic Iron & Steel Co., Youngstown, O.

John J. Beyer, manager foundry department, the Otis Steel Co., Cleveland, O.

C. A. Buck, vice president, Bethlehem Steel Co., South Bethlehem, Pa.

Associate Members.

Arthur P. Bowen, vice president, Pullman Co., Chicago.

E. W. Christ, purchasing agent, the Stanley Works, New Britain, Conn.

Benedict Crowell, Cleveland.

Cyrus Robinson, president, Metallurgical Engineering & Process Co., 29 Broadway, New York City.

Eugene McK. Froment, 150 Bank street, New York City.

Montgomery Murray, president, Keystone Bronze Co., Pittsburgh.

Morris Knowles, consulting engineer, Pittsburgh.

Christopher Minot Weld, 66 Broadway, New York City.

Robert Pendleton Bowler, president, Moa Bay Iron Co., 2 Rector street, New York City.

George A. Orrock, chief engineer of engineering department, New York Edison Co., New York City.

Frederick C. Baird, freight traffic manager, Bessemer and Lake Erie Railroad Co., Pittsburgh.

Martin S. Baldwin, elevator manufacturer, Otis Elevator Co., New York City.

Edward N. Breitung, 11 Pine street, New York City.

Richard Frank Grant, general counsel, M. A. Hanna & Co., Cleveland, O.

Walter Rachals, Youngstown O.

William H. Ridgway, Coatesville, Pa.

Brent Wiley, commercial engineer, Westinghouse Electric & Mfg. Co., Pittsburgh.

Higher Wages

Asked by Amalgamated Association —The Proposed Card

The Amalgamated Association of Iron, Steel and Tin Workers of North America, at the convention at Columbus, O., elected officers for the ensuing year and adopted proposed wage scales which will be presented employers as soon as meetings can be arranged. The proposed boiling card, affecting puddlers employed in mills controlled by the association, provides an increase in wages of 75 cents a ton. Other cards are much the same as those adopted a year ago, except that for catchers on tin mills, which proposes an advance of about 10 per cent. Changes in footnotes are suggested on all cards.

The new boiling card names $6 a ton as the base price for puddling on a 1-cent bar iron card, as against a rate of $5.25 provided by cards

agreed to by manufacturers the last two years. Up to and including the 1.25c bar iron card, the new wage scale proposes an advance of 15 cents a ton for boiling with each 0.05c advance on bar iron selling averages. Advances in puddling rates of 20 cents a ton are asked for each 0.05c advance in bar iron selling averages after the 1.30c bar iron card is reached.

Obituaries

John R. Scott, manager of sales for the Cleveland district of the Carnegie Steel Co., the Illinois Steel Co. and the Tennessee Coal, Iron & Railroad Co., died at his home in Cleveland Wednesday night, May 20, after a long illness. Mr. Scott was born in St. Louis, June 4, 1864. He entered the steel and iron business in St. Louis 28 years ago, representing J. Painter, Sons & Co. and later the American Hoop Co. After the United States Steel Corporation was formed in 1901, he became assistant manager of sales of the Carnegie Steel Co. and the Illinois Steel Co. in St. Louis. In 1902 he was transferred to New Orleans, where he took charge of the business of the two companies in that district. In 1904 he also assumed charge of the Atlanta office. Mr. Scott was transferred to Cleveland in 1905 and since that year represented the Steel Corporation companies in that city. He was president of the Marathon Tire & Rubber Co., Cuyahoga Falls, O., and a director of the Central National Bank, Cleveland. He was a member of the American Iron and Steel Institute, the Cleveland Chamber of Commerce and a number of clubs.

Mr. Scott had a very wide circle of friends, among whom were leading iron and steel manufacturers of the country. He had a highly efficient force of assistants in the Cleveland office and was beloved by all of them.

Funeral services were held at Lake View Cemetery, May 23, the Rev. Dr. Breed, of St. Paul's Episcopal Church, officiating. The active pall-bearers were chosen by Mr. Scott himself a few days before his death and were from the office force as follows: R. S. LeBarre, W. H. Brainard, F. F. Chiles, W. W. Johnston, J. H. Hughes, W. H. Forbes, R. C. Merchant, H. H. Quackenbush and B. C. Sawyer.

The honorary pall-bearers were: A. C. Dinkey, H. P. Bope, W. B. Weston, I. W. Jenks, J. C. Wallace, W. G. Clyde, George Baker, N. D. Carpenter, C. L. Hutchinson, W. H. Canniff, H. Coulby, J. J. Sullivan, D. J. Champion, J. C. Neale, W. J. Totten, F. E. Myers, W. G. Pollock, M. Andrews, S. D. Latty, L. H. Elliott, J. V. Morris, L. J. Cameron, H. T. Pratt, W. S. Gilkey, E. L. Fisher, W. N. Sawyer.

Leman D. Doty, aged 68, died May 24 at his home in Chicago. For 23 years he was purchasing agent for the Illinois Steel Co. Burial was at Amboy, Ill.

George Millard, of Burlington, Ia., secretary of the Citizens Water Co., and for many years connected with the Murray Iron Works Co., of that city, died May 4, at the age of 45.

William F. Crane, consulting engineer in New York City, died last week at Flatbush, L. I., and will be buried in Chicago. He was 55 years old. He was associated with the Crane Co. in Chicago until 25 years ago.

JOHN R. SCOTT

Charles Herman, inventor of the pneumatic jarring machine bearing his name, died at Zelienople, Pa., May 20, aged 70 years. He was vice president of the Herman Pneumatic Machine Co., Zelienople. Mr. Herman was born in Germany.

Herman M. R. Schiele, secretary of the Blymyer Iron Works Co. and the Cincinnati Bell Foundry Co., Cincinnati, died on May 21, at Battle Creek, Mich., after a protracted illness. Mr. Schiele was born in Stuttgart, Germany. He had been an official of the above named firms for the past three years.

Charles E. Pettee, identified with the machine tool trade, died at his home in Pittsburgh, May 21. He was born in Clayville, N. Y., 67 years ago. After service in the civil war he entered the employ of the Remington Arms Co., at Ilion, N. Y., and subsequently was with the George N. Pierce Bicycle Co., Buffalo, and the Westinghouse Machine Co., East Pittsburgh. In 1908 he became connected with the Herman Pneumatic Machine Co., Zelienople, Pa. For the last three years he had been a manufacturers' agent.

Albert F. Baumgartner, manager of the rail department of the George M. Newhall Engineering Co., Philadelphia, and well known in iron and steel scrap circles, both in the Philadelphia and Pittsburgh districts, died May 20 at the University Hospital in the former city from accidental gas poisoning. Mr. Baumgartner had been missing for several days and his friends becoming alarmed at finding his home locked, broke in and discovered him lying upon a couch in an unconscious condition. An investigation showed that gas was escaping from a water heater due to imperfect combustion and had filled the house. The circumstances indicated that Mr. Baumgartner, who was alone at the time, had lain down to rest for a few minutes and had been overcome. Before engaging in the re-rolling rail business at Philadelphia, several years ago, Mr. Baumgartner dealt in iron and steel scrap at Pittsburgh.

Personals

Andrew Carnegie sailed from New York, May 23, on one of his periodical trips to his Scotland estate.

Harry P. Sweeny has been appointed general superintendent of mines for the Thomas Iron Co., with headquarters at the Richard mine, Wharton, N. J. Mr. Sweeny is a graduate of the Massachusetts Institute of Technology and has had experience in Pennsylvania and in the west.

E. T. Stuart, treasurer and assistant secretary of the Cambria Steel Co., has resigned to become treasurer of the Pennsylvania Steel Co., succeeding E. M. Smith, resigned. A. P. Robinson, vice president of the Cambria Steel Co., has been made treasurer to fill the vacancy left by Mr. Stuart. Philip B. Burtes has been made assistant treasurer.

Edward T. Stotesbury has resigned from the directorate of the Cambria Steel Co., Johnstown, Pa., and from the executive committee of the Pennsylvania Steel Co., Philadelphia. E. E. Slick, vice president and general manager of the Cambria company, has been elected to the directorate of that concern, succeeding Mr. Stotesbury.

Commission Was in Error

But Can Prevent Fictitious Allowances, Says the Supreme Court

Washington, May 26.—With the decision handed down yesterday by the Supreme Court of the United States in the so-called "tap line" cases, affirming the decision of the former Commerce Court and reversing the Interstate Commerce Commission, it appears certain that the Commission will have to reverse itself in the Industrial Railways case. In that case, involving steel plant lines east of the Mississippi river, allowances granted them by trunk lines were held to be rebates. In consequence, trunk lines filed tariffs eliminating such allowances, estimated at $15,000,000 annually.

Striking similarity prevails between the decision of the Supreme Court of today and those of the Pennsylvania and New York state commissions recently holding that the steel plant lines involved were common carriers and entitled to participate in joint rates and through routes with the trunk lines. These latter decisions, like that of the Supreme Court, were in direct contrast to the opinion of the Interstate Commerce Commission in both the tap line and Industrial Railways cases. The lines in the Industrial Railways case are to the steel industry what the "tap lines" involved in today's decision are to the lumber industry.

It was only last week that the Interstate Commerce Commission denied applications meant to obtain a rehearing of the Industrial Railways case.

The Commerce Court enjoined the decision of the Interstate Commerce Commission in the tap line cases in 1912, the Commission having held then, as it did in the Industrial Railways case, that the tap lines could not participate in joint rates and through routes with the trunk lines.

It was held by the Supreme Court that the Commission was wrong in finding that the so-called tap lines were plant facilities and by inference not common carriers. The court found that the lines were common carriers; that the tap lines in the Louisiana appeal, certainly, were common carriers.

Further, it was held that the commission was in error and in fact acted in an arbitrary manner in putting one rate on proprietary and another on non-proprietary traffic. It was found, however, as had been expected, that the Commission has the power to regulate tap line allowances and to see that "fictitious allowances are not made".

The Logan Iron Works, Greenpoint, N. Y., for more than 50 years a manufacturer of buoys, sheet steel chimneys, boilers and tanks, has been closed permanently, business conditions being assigned as the cause. From 1,000 men the payroll gradually decreased to about 60. The property is to be sold.

Many Members

Attend Convention of Iron, Steel and Hardware Association

Under unusually favorable auspices, the fifth annual convention of the American Iron, Steel and Heavy Hardware Association was called to order at the Hollenden hotel, Cleveland, on Tuesday, by C. M. Roehm, president of the organization. The attendance was unusually large and well distributed geographically, delegates appearing from all sections of the country. Over 250 were enrolled the first day. The first session on Tuesday morning was given over largely to the customary addresses of welcome and response. The meeting opened with an invocation by the Rev. Worth M. Tippy, after which A. R. Davis led in singing "America". Addresses of welcome were made on behalf of Newton D. Baker, mayor of Cleveland, and M. A. Black, president of the chamber of commerce. On behalf of the active members of the association, the addresses of welcome were acknowledged by E. P. Sanderson, and on behalf of the associate members by Spencer Welton. The Tuesday morning session concluded with an address by Homer H. Johnson, describing the aims and purposes of the Chamber of Commerce of the United States of America. An executive session was held Tuesday afternoon at which various committee reports were received. The business sessions were adjourned at 4 p. m. for an informal dance which was held at the Hollenden hotel. Tuesday evening, the members and their ladies were tendered a ball by the Cleveland hosts.

Executive sessions were held Tuesday afternoon and Wednesday morning, at which reports were received from the secretary-treasurer, the executive commmittee, the spring and axle committee, the Woodstock committee, the transportation committee and the pad and nail committee.

Charles E. Faeth, of the Faeth Iron Co., Kansas City, was unable to be present and the paper which he was to present was replaced by a discussion of contract relations between manufacturers and distributors. This was opened by a paper which was read by Samuel L. Sewall, of the Minneapolis Iron Store Co., Minneapolis, Minn. Mr. Sewall contended that in cases where the manufacturer reduces the resale price of goods, which he has originally fixed, he should bear the loss that is usually loaded onto the shoulders of the jobber. Mr. Sewall also made a strong plea in favor of strictly enforcing the fulfillment of purchase contracts by both buyer and seller. He would, he said, eliminate the jug-handled contract or the one which amounts to but little more than an option on a portion of the manufacturer's output. The discussion following the reading of Mr. Sewall's paper was opened by D. A. Merriman, assistant sales manager of the American Steel & Wire Co., Chicago. The whole discussion tended to place the relations of manufacturers and distributors on a more cordial basis and to clear up many disputed points.

New York State Co. Plant Sold

The property and plant of the New York State Steel Co., Buffalo, which has been in the hands of receivers and shut down for some time, was sold at auction, by order of United States District Court Judge John R. Hazel, at Buffalo, on May 25. The plant and equipment, valued it is claimed, at $4,000,000, was purchased by the bondholders' committee, representing the interests to be satisfied by the proceeds of the sale.

Unofficially it was stated that the sale brought in the neighborhood of $800,000. Counsel for the bondholders' committee says it has held no meetings as yet to decide upon the future utilization or the development of the property.

Argument in Corporation Suit

The final argument in the suit of the government for the dissolution of the United States Steel Corporation will be heard before the United States court in Philadelphia, beginning on Oct. 20.

Mine Purchased

The Cleveland-Cliffs Iron Co. has purchased from the Cambria Steel Co. the Republic mine located about 22 miles southwest of Marquette, including the hydro-electric power plant and about 5,000 acres of land.

American Blast Furnace Practice

First of a Series of Three Articles Dealing With the Economical Production of Pig Iron Using Fine Mesabi Ores

BY HERMANN A BRASSERT

THE TREND of development in the manufacture of pig iron is much the same the world over. With more and more difficult raw materials, progress is not so much in the direction of new records of production and fuel consumption, as in the ability to maintain the best results of the past in the face of greater handicaps. Since this paper cannot cover all conditions of raw materials and every kind of practice, I will confine myself largely to the foremost problem which the present generation of American blast furnace men has been called upon to meet—the smelting of fine ores, especially those from the Mesabi range.

Modern blast furnace art is as much the result of practical experience and common sense as it is of science; however, the underlying principles of the process must be understood in order to appreciate its possibilities, as well as its limitations. I will, therefore, give a brief outline of the theory of the blast furnace process, and then discuss the possibilities and means of obtaining better economy, dealing first with the raw materials, next with the construction, and finally, with the operation of the furnace.

The blast furnace process for the production of pig iron is an invention of the middle ages. It was practiced in Germany in a primitive manner as early as the beginning of the thirteenth century. The first American blast furnace was built in 1644 on the shores of Massachusetts Bay. A tremendous development has taken place since the early days, but the process, in principle, has remained the same. The reason for its survival to the present day lies in its economy. It always has been, and is today, the most efficient of all metallurgical processes.

The blast furnace performs the task of preheating the ores, reducing their metallic contents, and melting the resulting iron and slag, in one continuous process, and in the same vertical stack. The counter-current principle is employed, whereby raw materials and gases travel in opposite directions, the heat of the latter being transmitted gradually to the former, with the result that the waste gases leave the process at the point of lowest temperature, whereas the materials to be melted enter the zone of fusion highly preheated.

By the concentration of heat in a comparatively small area in the lower part of the furnace, radiation losses are small as compared to other metallurgical furnaces. Being practically constant per unit of time, for a given furnace, they decrease almost in proportion to increased output, and under modern conditions are kept well below 10 per cent of the total heat involved.

This paper, which was presented at the spring meeting of the American Iron and Steel Institute in New York, May 22-23, contains facts, figures and suggestions that will be found of great value to everyone connected, even indirectly, with the iron and steel business. Mr. Brassert, the author, is superintendent of blast furnaces for the Illinois Steel Co., Chicago. He was born in London, of German parentage, in 1875, *and was educated abroad, studying in Freiburg, at the Mining School of Loeben, Austria, and at the University in Berlin, where he graduated as metallurgical engineer in* 1896. *After working two years in iron, steel and coke oven plants abroad, Mr. Brassert came to America and entered the employ of the Carnegie Steel Co., in* 1898. *He was appointed superintendent of the Edgar Thomson furnaces in* 1901 *and assumed his present position in* 1905.

The loss of sensible heat in the waste gases is decreased to a minimum by the continuous transmission of heat from the gases to the descending stock.

Direct and Indirect Reduction

Simultaneously with this transfer of heat from gases to raw materials, and in the same manner, the reduction of the oxides takes place. The descending ores are gradually reduced by the carbon monoxide of the rising gases, the leanest gases coming in contact with the highest oxides at low temperatures near the top, the richest gases meeting the ores in their final stage of reduction near the melting zone. Thus the largest possible proportion of the iron oxides is converted into metallic iron in the most economical way, for the reduction by carbon monoxide of Fe_2O_3 is a slightly exorthermic reaction, and that of FeO, while being endothermic, requires only a small amount of heat. The direct reduction by solid carbon, on the other hand, which must be applied to such portions of the iron oxides as have escaped the indirect reduction, is much more extravagant, requiring five and six times more heat than the reduction by the gases.

Since iron oxides are reduced by the gases in the blast furnaces only within a certain range of temperature, lying between 200 and 1,100 degrees Cent., and since it is difficult for the gases to reach every particle in a big bulk of ore in time for proper preheating and reduction, it will be at once understood that the furnace charge must descend regularly and the contact between gases and stock must be both intimate and uniform, in order to facilitate the indirect reduction by the gases.

These fundamental principles have always been the same, yet there exists quite a variation in the efficiency of different furnaces in actual practice, even when working under the same conditions. An efficiently operated furnace is delicately balanced and is easily influenced by irregularities of any kind. Slight changes of temperature disturb the equilibrium between direct and indirect reduction. An increase of direct reduction consumes additional carbon which otherwise would have been available for combustion at the tuyeres, there to generate heat for the melting process, and this fuel must be replaced by charging more coke at the top. The reduction by solid carbon consumes also more heat than that by CO, which again has to be replaced by adding more fuel. The larger the ratio of coke to ore in the charge, the greater the quantity of top gases per ton of iron, and the higher their temperature and calorific value, resulting in further loss of heat to the furnace.

Increased top temperature shortens the zone of possible reduction by CO, since CO_2, which is the product of this reaction, cannot exist at high temperatures in contact with carbon. Under such conditions any CO_2 formed in the reduction of ore or calcination of limestone immediately reacts with carbon, forming CO which lowers the ratio of CO_2 to CO

in the gases, resulting in a further loss of carbon for the generation of heat at the tuyeres. This explains why such a large excess of fuel is generally required to bring a cold furnace back to a normal condition.

The top temperature, therefore, in conjunction with the ratio of CO_2 to CO in the escaping gases, is a true indicator of blast furnace economy. The higher this ratio, the more efficient the reduction process. Low top temperatures go hand in hand with high CO_2:CO ratios, and high top temperatures with low ratios.

Table I

RESULTS OF SIEVE TESTS AT SOUTH WORKS

Ores.	Per cent.	Per cent on Screen: No. 2	No. 8	No. 20	No. 40	No. 60	No. 80	No. 100	Through No. 100
Mesaba	83.3	25.40	26.86	12.54	10.86	6.92	2.76	3.34	11.33
Old range	16.7	30.16	30.76	15.01	8.14	4.16	2.06	2.74	7.01
Total	100.0	26.10	27.58	12.93	10.51	6.44	2.56	3.23	10.69

Uniformity and Heat Concentration the Keynote

The success of a blast furnace operation is measured by three results—quality of product, rate of output, and economy of operation. The first step toward their attainment is the realization that they can be accomplished by identically the same practice, the keynote of which is uniformity and heat concentration. If a blast furnaceman strives for a uniform operation, giving the highest production combined with the lowest fuel consumption, he will also obtain the best grade of iron. The incessant struggle for uniformity should embrace not only the raw materials, but their distribution and descent in the furnace, brought about by proper plant design and furnace lines, as well as by intelligent operation. Such efforts will result in maintaining the largest possible proportion of indirect reduction, which allows the maximum amount of the carbon charge to be burnt at the tuyeres, and gives the highest hearth temperature, which means the best grade of iron. The escaping top gases will then have the lowest temperature and the highest ratio of CO_2 to CO, and will approach the ultimate economical limit, which is reached when the CO_2:CO ratio becomes so low—i. e., the gases so lean—that they have lost their reducing power; or when the top temperature has been decreased to a point where the ores are not properly preheated for the reduction and melting process. This limit is determined by the reducibility of the ores. How closely it can be approached in practice on various grades of iron depends on furnace construction, mode of operation, and their proper adaptation to the raw materials.

In most countries the manufacture of iron starts with the best ores, rich in iron, and of a favorable physical structure. Such conditions facilitate good furnace operation and favor low fuel consumption, but they also tend to retard progress. In modern times, and in all civilized countries, the supply of high grade ores has been greatly reduced, compelling the use of materials leaner in metallic content and of adverse physical character, which render good blast furnace practice much more difficult. This, however, stimulates improvement, and today ores are economically smelted which were formerly discarded. In fact, thanks to improved furnace construction, a general change in opinion as to the most desirable materials is taking place; and while formerly coarseness was considered an indispensable quality, we now object to large lumps and prefer granular ores, as they allow the closest contact between their metallic contents and the furnace gases, and therefore can be reduced with a minimum expenditure of fuel.

Very fine ores are undesirable because too large a portion is carried over with the gases, increasing the loss. They also make the stock column too dense and induce channeling of gases, with the result that part of the ores are not properly prepared before reaching the melting zone, and part of the gases reach the top of the furnace without having fully exerted their reducing power or given off their sensible heat. Fine materials also tend to adhere to the walls of the furnace and result in scaffolding, hanging and slipping—symptoms familiar to every furnace man who has used Mesabi ores.

These conditions are sometimes aggravated by the dissociation of CO, induced by the presence of finely divided oxides of iron in the upper part of the furnace. The result of this reaction is a deposit of fine carbon upon the ore charges, causing them to swell and increasing the tendency of the furnace to hang.

Difficulties of Handling Fine Ore Exaggerated

Too much importance, though, has been given to this phenomenon, especially in foreign literature. We have sufficient proof that it does not take place, to any marked extent, in a normally driving furnace. In Lake ore practice, the color of the gases escaping from the furnace top during slips is a clear, reddish brown; black smoke, showing the presence of finely divided carbon, issues only after protracted periods of hanging. Furnaces using the highest percentages of Mesabi ores will run along for many months without ever showing any sign of carbon deposition, so that this reaction evidently has no bearing on the economy of the process.

Fine ores can be worked to the best advantage when they are delivered to the furnace in a state of physical and chemical uniformity. The United States Steel Corporation has made a special study of this problem and has developed a system of mining, sampling, grading and mixing its ores, which has resulted in a remarkable

Table II

PER CENT LOSS IN WEIGHT OF COKE AFTER BEING TREATED WITH CO_2 FOR TWO HOURS

Kind of coke.	Samples crushed to pass through ½ in. and remaining on ¼ in. mesh at 800 deg. Cent.	900 deg. Cent.	1,000 deg. Cent.	1,100 deg. Cent.	Samples crushed to pass through 80-mesh at 800 deg. Cent.	900 deg. Cent.	1,000 deg. Cent.	1,100 deg. Cent.
Connellsville	0.25	0.19	1.97	4.38	0.20	5.00	9.70	52.80
Klondike	0.45	0.84	2.90	6.50	0.50	4.55	16.27	46.33
By-product:								
No. 1.....	0.50	1.34	4.92	10.26	0.80	5.45	15.75	40.98
No. 2.....	0.25	0.87	3.68	9.46	0.45	3.15	17.40	51.18
No. 3.....	0.40	0.70	3.00	10.10	0.50	4.20	13.00	64.60
No. 4.....	0.25	0.83	6.10	10.14	0.80	3.35	16.65	47.02

uniformity of the various shipping grades. This is the more remarkable considering the great variation of the physical and chemical character of the ores contained in the same mine.

As an example of the fineness of burdens carried at the present day, Table I gives the results of sieve tests on all the ores shipped to the South Works of the Illinois Steel Co. during the season of 1913.

The suitability of any iron bearing material for blast furnace use depends on its physical form as well as on its degree of oxidation. Large lumps, even of easily reducible ores, are objectionable, because they reach the melting zone improperly preheated and reduced only on the surface. The same materials, which, if charged in the form of lumps, cool off the hearth, can be used to good advantage if properly crushed.

Pretreatment of Ores

With increasing fineness of the ores, on the other hand, it appears more and more desirable to render the burden more open by preliminary treatment of the finest materials.

Considerable is already being done in this regard by sintering and nodulizing the ores, and much will undoubtedly be accomplished in the future. By the addition of a comparatively small percentage of such pretreated materials the physical character of the entire charge can be greatly improved. The first step in this direction is to treat the flue dust instead of recharging it in the raw state.

Briquettes of flue dust and ore are made on a large scale in Europe by a number of well-known processes. In this country their introduction has been slow. The difficulty is to make them sufficiently strong, yet not too dense, and without introducing undesirable elements as binder.

Sintering, by the down-draft process, and nodulizing in a rotary kiln are practised to excellent advantage on flue dust. They give a product of considerable physical strength and great porosity, which it is easy to reduce if agglomerated without melting. A rotary kiln, treating about half of the flue dust produced has been in operation at the South Works of the Illinois Steel Co. for the past eight years. Its nodules of uniform size, rich in iron, and pre-reduced in the kiln without being melted, have proved beneficial to the burden, even in furnaces running on the lowest coke consumption.

As the ores become leaner in metallic contents, the gangue gradually increases, until it may become an economical necessity in order to save transportation charges, to locate the furnace plant nearer the ore deposits, or by treatment of the ores, to eliminate part of the gangue, which will also serve to reduce the cost of smelting.

Ores high in alumina have previously been considered very undesirable, if not prohibitive, for blast furnace use on account of the generally experienced decrease in fluidity of slags with increase in alumina contents. One of the most important of recent developments in American blast furnace practice is the commercial use of Cuban ores, very high in alumina.

Highly silicious ores, on the other hand, will never be suited for direct smelting except in mixture with self-fluxing ores, on account of the excessive amount of limestone required to flux the silica. A silica content affects the economy of the melting process at an increasing rate, as soon as it exceeds the amount necessary to form the desired slag volume. The elimination of silicious gangue, clay, gravel, or sand by washing is conducted on an extensive scale on the Mesabi range, the largest plant being operated by the United States Steel Corporation at Coleraine, with a daily capacity of from 30,000 to 35,000 tons of washed ore. By this operation ores with 45 per cent iron content are enriched to 56 per cent of iron, and at the same time a silica content of 30 per cent is reduced to 10 per cent and less.

Table III

COKE PER TON OF IRON IN AMERICAN FURNACES

Year.	Per cent. Mesabi.	Pounds. coke.
1902	43.8	2,155
1903	50.3	2,191
1904	55.0	2,239
1905	61.0	2,275
1906	65.2	2,343
1907	68.7	2,362

Another field of great promise for the future lies in the concentration of titaniferous magnetites and in their successful use in the blast furnace. It is quite possible, and the latest results seem to indicate, that slags high in TiO_2, if uniform, will offer no more serious obstacles than those high in alumina, not to mention the possible advantage of the titanium content in pig iron for foundry or other special grades.

The commercial possibility of the reclamation of ores by washing, drying, magnetic concentration, sintering and roasting, must always depend on their physical and chemical character, on the cost of power, mining and transportation, and sometimes on the value of tailings as a by-product.

Whether the ores are used in their natural state or after preparatory treatment—which in the case of concentration always involves a loss of metallic contents in the tailings—the maximum possible yield of iron from any deposit is determined by the percentage of metallic contents in the ore; and this yield would be attained by their complete conversion into pig iron without any loss in flue dust and slag. The loss of iron in the slag is a comparatively small item, and quite uniform everywhere. The downcomer loss, while showing a greater variation, can be recovered by treating the flue dust and re-charging it into the blast furnace. Thus it is seen that the consumption of ore per ton of iron in the blast furnace is largely fixed by nature.

Some Problems for the Coke Maker

The consumption of coke, on the other hand, which is an artificial product, is subject to much greater variations, and depends to a far greater extent on human skill. To manufacture a coke of the most desirable quality and to develop the most suitable furnace lines are, today, the two foremost tasks in striving for better furnace economy.

The fuels given us by nature are poorly suited for the blast furnace. In remote times wood was used. In order to obtain greater calorific intensity, this was later converted into charcoal, which, being chemically very pure, was particularly suited to the production of low sulphur iron. Rapid deforestation, however, compelled the introduction of coal as a blast furnace fuel as early as the beginning of the eighteenth century. The scarcity of proper coals, and the tendency, even of the anthracites, to crush and crumble in the furnace charge, led to the coking of the coal. The resulting artificial product was soon found to be superior, and rapidly replaced the use of even the best anthracites.

The coking process was at first conducted in bee-hive ovens. While capable of producing a coke of satisfactory quality, the bee-hive process is very uneconomical, on account of wasting the coke oven gases and their valuable by-products as well as part of the fixed carbon of the coal charge. Its lack of economy and its limitations to certain grades of coal led to the development of the modern by-product oven, which affords the possibility of using a greater variety of coking coals; and owing to the recovery of the by-products and the higher yield, permits the assembly of coals at the ovens, there to be mixed in proper proportions for the purpose of manu-

facturing a uniform and suitable blast furnace coke. In the by-product coke oven a satisfactory coke can be made from coals which cannot be coked to any advantage in bee-hive ovens, and enormous coal fields have become available for the manufacture of metallurgical coke largely adding to the national wealth.

Bee-hive ovens, on account of their low yield, are naturally located at the coal mine, necessitating the use of only one kind of coal, and making a product which is subject to all the variations of the coal from this particular mine. Furthermore, due to the limited supply of coal from a single mine, a bee-hive operation generally does not produce sufficient coke to supply a large blast furnace plant, so that often a number of different cokes have to be used on a furnace and the uniformity of this mixture is very difficult to control.

The by-product process is more flexible in the coking operation and is capable of improving the quality of the coke by variations of temperature and coking time to an extent unknown and impossible in bee-hive practice. By locating the by-product ovens at the blast furnace and making them a part of the furnace or steel plant, the daily co-operation of manufacturer and consumer insures the best possible furnace results.

A hard metallic structure has always been considered the first requisite of a good furnace coke, indicating its ability to resist abrasion. The crushing effect of the charges by weight is comparatively small, and the average furnace coke has many times the required strength. But the abrasive treatment to which the coke is subjected in the handling, particularly in the furnace where it is simultaneously attacked by the gases, is severe; and unless the coke is hard, but not too brittle, and tough without being soft, it will go to pieces on its downward path in the furnace.

While fine, soft ores in the burden protect the coke against abrasion, the presence with such ores of coke breeze and dust is particularly detrimental by further increasing the density of the stock column and by accumulating on the walls, causing scaffolds to form. The heat value of coke dust to the furnace is practically nil, since that portion which is not blown over into the dust catcher is consumed in direct reduction with the ores and by the CO_2 in the gases, so that it has but little chance of ever reaching the tuyeres.

The effect of size on the vulnerability of the coke to dissolution by CO_2 is shown by laboratory tests which were made at South Works to determine the loss in weight of various kinds of coke on treatment with dry CO_2 at different temperatures. The results of the tests are given in Table II.

These results give an idea of the extent of the destruction of fine coke by CO_2 in the upper part of the furnace, and show the futility of charging breeze and dust into the stack with the expectation of obtaining heat value therefrom. The presence of large percentages of coke dust brings with it another disadvantage, in that it vitiates the composition of the flue dust and renders it more difficult to treat. Blast furnace coke should, therefore, be thoroughly screened at the ovens or in the furnace bins, preferably in both places, in order to obtain the cleanest possible fuel.

Careful screening is also beneficial in that it lowers the ash contents of the coke, and sometimes the sulphur, as shown by the figures given in Table III, which represent averages of a large number of American furnace plants using like ores.

Until recent years the detrimental influence of high ash was not seriously felt in this country; therefore, the washing of coals, so common in Europe, is still the exception here. But with leaner ores and increased cinder volume, the duty of fluxing an excess of coke ash begins to seriously increase the cost of smelting. In Lake ore practice, with 7 per cent silica in the ores, pure stone and low fuel consumption, an ash content up to 10 or 11 per cent in the coke represents a slag volume which is not detrimental to good practice. An excess of ash in the coke results in a three-fold loss, in the shape of wasted expenditure for transportation, additional flux, and the loss of efficiency through its taking up space and heat in the furnace which should have been applied to an equivalent amount of ore.

Even more objectionable than ash is sulphur, if it exceeds a certain limit, determined by the composition, temperature and volume of the slag. These in turn are either fixed by the raw materials, or chosen to produce a certain grade of iron. To eliminate sulphur as ordinarily present, it must be dissolved in the slag, which for a given composition and hearth temperature, has a fixed saturation point, and can take care of only a limited amount of this element. In Mesabi ore practice a sulphur content of over one per cent in the coke is very objectionable, considering the prevailing cinder volumes and the inability to obtain uniform furnace operation on very basic slags.

The problem of reducing ash and sulphur in our coking coals by dry methods or by washing opens up a wide field for profitable labor. By-product coke should be properly quenched without any excess of water. Over-quenching spoils the surface, injures the structure and fractures the coke. When the coke is charged into the furnace by weight, a low moisture content is important also in confining the variations to a smaller range.

The physical standard by which blast furnace coke is generally measured, besides hardness and resistance to abrasion, is its porosity. It has been recognized that an open cell structure favors rapid combustion whereas a dense structure retards it. Since the speed of combustion primarily affects the furnace practice, it appears that the combustibility of cokes should be considered a foremost quality.

Coke Should Burn at the Proper Speed

The importance of the combustibility of cokes was first brought to my attention in 1906, through the use of bee-hive Pocahontas coke on the large furnaces at the South Works of the Illinois Steel Co. In appearance and structure it differed from the Connellsville and Klondike grades, but the porosity tests scarcely revealed the great difference in the action of these cokes in the furnace. A furnace which on Connellsville or Klondike coke worked normally, would on Pocahontas drive at an excessive speed. The blast pressure would drop several

Table IV

COMBUSTIBILITY OF COKE

Kind of coke.	Comparative Loss of Various Cokes on Ignition in a Limited Current of Air Loss in Weight at 300 deg. Cent.	400 deg. Cent.	500 deg. Cent.	600 deg. Cent.	700 deg. Cent.	800 deg. Cent.	900 deg. Cent.	1,060 deg. Cent.
By-product:—								
No. 1 (Gary).....	0.20	0.20	0.79	13.55	15.35	14.90	15.95	19.80
No. 2 (Special).....	0.64	0.59	6.23	14.50	15.75	15.72	16.80	22.48
No. 3 (Special).....	0.62	0.47	4.18	14.55	15.70	15.60	16.20	22.60
Kentucky Beehive.....	0.46	0.78	3.90	13.40	15.80	14.35	15.40	20.75
Connellsville Beehive...	0.15	0.15	0.58	9.15	13.70	13.25	14.10	17.00

pounds, and the hearth would become cold, necessitating a decrease of the tuyere area and wind volume, and a lightening of the burden.

The extreme softness of the coke evidently made it highly vulnerable to dissolution by CO_2 in the furnace stack. This and excessive abrasion reduced it to small size, favoring direct reduction, which accelerates the movement of the stock, and not sufficient coke reached the tuyeres to maintain the temperature of the hearth. On the small furnaces at the Union and Milwaukee works this coke, for apparent reasons, gave better results.

At this time I made a series of combustion tests with these cokes, which showed vast differences in the time required for the complete combustion of a fixed amount of coke with natural draft under equal conditions. The time required for complete combustion of the bee-hive Pocahontas coke amounted to only 47 per cent of the time required to burn the same weight of Connellsville or Klondike.

With these results at hand, we experimented in the following years with different mixtures of these cokes, in order to arrive at the degree of combustibility which would produce the best results in conjunction with our ore mixtures and furnace lines. In this manner bee-hive Pocahontas coke was successfully used in mixture with hard cokes. The best proportions proved to be two-third hard and one-third soft coke, as illustrated by the performance of No. 6 blast furnace at the South Works, which from Jan. 3, 1909, to Dec. 18, 1910, on this mixture, produced 307,517 tons of basic iron, on an average fuel consumption of 1,969 pounds of coke per ton of iron.

Whereas in bee-hive ovens the Pocahontas coal, if charged by itself, gave too soft and vulnerable a fuel, the early coke produced in our by-product ovens even from the same coals burned too slowly and made our furnace operations exceedingly difficult by preventing rapid and continuous movement of the stock. Observing the action through the tuyere glasses would reveal each piece of such coke moving slowly and requiring considerable time before being entirely consumed, whereas coke of proper combustibility dances lively at the tuyeres and quickly disappears. With fast-burning coke, each molecule of oxygen in the air immediately finds its molecule of carbon in the tuyere zone, and the combustion takes place rapidly and with great intensity. By thus concentrating the combustion in a comparatively small area, the highest heat effect is obtained. With slow-burning coke, on the other hand, the molecules of oxygen are not all able to combine immediately with their molecules of carbon. The result is that the combustion is carried higher up in the furnace, the heat generated by combustion is spread over a larger area, and the top temperature increases. The coke pieces being consumed but slowly, no rapid shrinkage of the stock takes place, such as characterizes a fast driving furnace with a highly heated combustion zone. Consequently the blast pressure goes up, the furnace begins to hang, and good practice becomes impossible.

On small furnaces such slow-burning coke interferes even more seriously with the practice than on large furnaces, because the wind volume and pressure cannot be sufficiently increased to accelerate the combustion. The extremely poor results with some by-product coke led to the breaking of the larger coke pieces, with the object of increasing the active surface of the coke charge and improving the combustion particularly for the use on smaller stacks. While better results were obtained in this manner, the proper remedy in the manufacture of a uniform coke with suitable combustibility.

The laboratory tests quoted in Table IV illustrate that by-product coke can be made with as good combustibility as Connellsville bee-hive coke. As a practical proof of what results have been accomplished in perfecting the quality and uniformity of by-product coke, those obtained on the blast furnaces at the South Works with coke from the Gary and Joliet ovens, are of interest. The coke was made with a coking time of from 16 to 18 hours using 60 per cent and over of low volatile Pocahontas coal in a mixture with various high volatile coals. The South Works furnaces by their average coke consumption of 1,944 pounds during the past 12 months have established a yearly fuel record for any group of furnaces using a similar grade of ores. The detailed figures are given in Table V.

As the economical smelting of the finer and leaner ores of modern times requires special care in the manufacture of coke in order to obtain the best furnace practice, so also should

Table V

ILLINOIS STEEL COMPANY, SOUTH WORKS

Average Daily Production by Months and Coke Consumption per Ton May, 1913, to April, 1914, Inclusive

Bessemer Pig Iron

Month.	No. 2 Furnace Tons.	No. 2 Furnace Pounds coke.	No. 3 Furnace Tons.	No. 3 Furnace Pounds coke.	No. 4 Furnace Tons.	No. 4 Furnace Pounds coke.	"E"† Furnace Tons.	"E"† Furnace Pounds coke.	No. 9 Furnace Tons.	No. 9 Furnace Pounds coke.	Total Bessemer Tons.	Total Bessemer Pounds coke.
May, 1913	543	1,942	491	2,179	...	.....	565	1,941	511	1,963	528	2,001
June	528	1,974	411	2,209	Blown out		570	1,916	502	1,958	503	2,002
July	541	1,912	408	2,365	4–15–13		455	2,087	468	1,926	467	2,057
August	515	1,886	496	2,006	Tonnage:		521	1,912	469	1,991	500	1,947
September	508	1,898	523	1,890	723, 237		525	1,691	516	1,837	518	1,828
October	496	1,936	514	1,964	...	.....	514	1,711	530	1,849	514	1,865
November	473	1,946	526	1,937	Blown in		467	1,783	437	2,144	477	1,949
December	...	.....	500	1,932	2–15–14		536	1,705	513	1,798	515	1,822
Jan., 1914	Blown out		474	1,958	...	.....	463	1,821	...	.....	469	1,903
February	11–23–13		479	2,044	290	2,464	489	1,950	Blown out		445	2,058
March	...	.....	487	2,061	518	1,744	559	1,815	12–18–13		521	1,868
April	...	.....	507	1,991	543	1,702	540	1,845	...	.....	528	1,842
Aver. for 11 mths.	517	1,927	484	2,023	485	1,806	518	1,851	492	1,936	501	1,927
Total tons made on present lining at end of period:—	475,442		788,512		36,414		417,117		593,007			

Basic Pig Iron

Month.	No. 5 Furnace Tons.	No. 5 Furnace Pounds coke.	No. 6 Furnace Tons.	No. 6 Furnace Pounds coke.	No. 7 Furnace Tons.	No. 7 Furnace Pounds coke.	No. 8 Furnace Tons.	No. 8 Furnace Pounds coke.	No. 10 Furnace Tons.	No. 10 Furnace Pounds coke.	Total Basic Tons.	Total Basic Pounds coke.
May, 1913	487	2,159	422	1,960	570	1,828	467	2,039	484	1,926	486	1,977
June	491	2,195	413	1,991	516	2,077	439	2,052	505	1,893	473	2,043
July	437	2,177	396	2,010	419	2,108	506	1,900	491	1,923	450	2,016
August	397	2,351	433	1,958	546	1,987	482	1,872	478	1,962	477	1,876
September	...	.....	468	1,873	530	1,963	529	1,792	500	1,942	503	1,893
October	Blown out		451	2,007	531	1,910	519	1,840	...	.....	500	1,915
November	8–25–13		389	2,016	572	1,903	527	1,894	Blown out		496	1,929
December	Blown in		522	1,654	582	1,877	532	1,886	10–1–13		551	1,871
Jan., 1914	2–6–14		...	.....	419‡	1,986	536	1,938	...	.....	482	1,958
February	402	2,110	Blown out		529	2,022	506	2,029	...	.....	484	2,046
March	529	1,882	12–4–13		532	2,042	534	1,888	...	.....	532	1,937
April	520	1,910	...	.....	567	1,870	537	1,904	...	.....	542	1,894
Aver. for 11 mths.	476	2,079	426	1,969	526	1,960	507	1,915	510	1,929	493	1,961
Total tons made on present lining at end of period:—	41,252		247,572		279,639		223,175		205,698			

No. 1 furnace on special grades.
† "E" furnace banked, Dec. 24, 1913 to Jan. 10, 1914.
‡ No. 7 furnace banked, Dec. 24, 1913 to Jan. 10, 1914.

we carefully prepare the flux and adapt it to the fineness of the ores and their increasing silica content.

Limestone Should Be Screened

The ore charges themselves have become so dense that any further additions of fines with the limestone are detrimental, and these should be eliminated by screening. At the same time, big lumps of stone are also more objectionable than formerly, because with the fast driving of a modern furnace they have not time to become properly preheated and reduced before they reach the melting zone. Lumps of raw lime usually make their appearance at the tuyeres when large stone has been charged. Stone for blast furnace use should, therefore, be crushed. Some stones are harder to reduce than others and should be broken relatively smaller. The fines should be eliminated by thorough screening.

Formerly when the silica in the ores was so low that the cinder volume without the addition of special silicious materials was below the practical limit, a limestone containing 5 or 6 per cent of silica was not objectionable. More silica in the limestone simply meant that less of these cheap materials could be used; but, providing it was uniform, it did not seriously affect the furnace practice. Today, however, the natural silica in the ores has generally increased the slag volume to a point where it exceeds that required for carrying off the sulphur and insuring regular furnace operation. A reduction in the silica of the limestone represents, therefore, a direct saving in coke. It will also be found that the lower the silica content of a stone, the more uniform it will be, which is a factor of great importance.

While a moderate magnesia content in the slag is not objectionable, the use of dolomite is injurious to good furnace practice with lake ores, where the slags are fairly high in alumina and where a low zone of fusion must be maintained. To eliminate the sulphur it has been found necessary in our practice to run on a more basic slag when using dolomite, which makes uniform furnace operations more difficult and results in a higher fuel consumption. With slags very low (about 8 per cent) or very high (about 30 per cent) in alumina, the use of dolomite has been found beneficial, as also in the manufacture of spiegel and ferro-manganese.

Supplying Air to the Furnace

Of all the elements introduced into the blast furnace in a given unit of time, air is the largest both by volume and by weight. It is, therefore, not surprising that great efforts were made towards its improvement. The cold blast of the early days was replaced in the beginning of the last century by the hot blast. With the iron pipe stoves first used, only moderate heats could be carried. Some fifty years ago fire-brick stoves took their place, which allowed the blast temperatures to be increased to those of the present day. The introduction of hot blast marks the greatest step ever taken in improving the economy of the blast furnace. By the use of hot blast, combustion is accelerated, intensified and confined to a smaller space, the melting zone is concentrated, and the hearth assumes a higher temperature. The grade of iron becoming richer, demands more burden of ore to the charge of coke. This decreases the amount of gas per ton of iron and in turn reduces the top temperature, again saving heat and making possible a more economical reduction. It also causes less carbon to be consumed by CO_2 in the upper part of the furnace, whereby more is made available for combustion at the tuyeres. These effects being cumulative, the application of hot blast resulted in a far greater fuel saving than was expected from the mere addition of the heat units contained in the blast; and hand in hand with it went a large increase in production.

Another more recent method of obtaining fuel economy is the Gayley dry blast. The effect of this is the same as that of an equivalent increase in blast temperature. In addition it gives to the furnace a uniform supply of oxygen by weight. To this uniformity is attributed the extraordinary saving, particularly in localities with moist and variable climates, which in some cases was found to be greater than that corresponding to an equivalent increase in blast temperature. Its applicability depends on local conditions influencing the comparative cost of drying the air versus raising its temperature and upon existing furnace efficiency. At plants where a further increase of blast temperature is not profitable because of limited heat concentration, the dry blast will fail to be economical except in the effect of its uniformity which in natural air practice can only be approached by the most careful regulation of blast heats and of the weight of air blown.

The latest effort to improve the air, by enrichment with oxygen, is being made in Europe, whether with profit or not remains to be seen. Since the ratio of CO_2 to CO cannot be increased above the point where the gas loses its reducing power, and this point remains the same whether or not it is diluted with nitrogen, and since this limit, as well as that of lowest top temperature, can be approached by the employment of less expensive means, it is at least doubtful if the oxygen method will ever come into general commercial use. The uniform heating of the furnace charges to the melting point requires time and a certain volume of gases, and these apparently cannot be decreased, even if it should be possible to shorten the reduction period by lowering the inert nitrogen content of the gas. The hot blast and dry air blast bring an increment of heat into the furnace, while higher oxygenated air only intensifies the generation of heat from the fuel within the hearth.

(To Be Continued)

McLain's System

McLain's System, Goldsmith building, Milwaukee, recently has issued two booklets devoted to its course in foundry practice, particularly relating to the production of semi-steel. One booklet contains 48 pages and is replete with testimonial letters from students of this school who have been greatly benefited by this course. Numerous views of semi-steel castings also are included, together with sketches of a large number of successful foundry foremen and superintendents who testify to the value of McLain's course. The other booklet is entitled "A Story of Foundry Success", the contents being taken from the private correspondence between A. J. Witt, general manager of the Cumberland Foundry & Mfg. Co., Nashville, Tenn., and David McLain, founder of McLain's System. This correspondence reflects in detail the service rendered by McLain's System aside from the course in foundry practice furnished to the students of this school.

The Reading Iron Co., Reading, Pa., has placed an order with Frank C. Roberts, engineer, Real Estate Trust building, Philadelphia, for a patent stock line protecting device to be installed in the Crumwold furnace at Emaus, Pa. This is the second Roberts' stock line protecting device to be installed by the Reading Iron Co., the first having been placed in the Keystone furnace some months ago.

The new edition of The Simplex Manual, published by the Simplex Wire & Cable Co., Boston, is ready for distribution to any one who asks for it. The 92 pages are full of tables and other information of all sorts about insulated conductors and other matters electrical, and are served by a very complete index.

How Heat Treating Affects Wire

By Proper Annealing, Patenting and Tempering the Wire Maker Produces a Product of Any Desired Quality

BY JOHN F TINSLEY

IN THE WIRE industry, the use of heat treatment in the broad definition of the term is very old. In fact, the development of the wire business has been due primarily to an early appreciation and application of such fundamental heat treatment processes as annealing, hardening and tempering. The principal heat treatments used in the manufacture of wire are annealing, patenting and hardening and tempering. The object of this paper is to present as comprehensively as possible, consistent with the brevity that is necessary in the treatment of a very broad subject, a discussion of the practical application of these basic heat-treatment processes, which affect by far the largest tonnages in the manufacture of steel wire.

Annealing serves to accomplish three important functions: (1) To remove the effects of hardening due to cold work in wire drawing or cold rolling, thus making the steel ductile and soft. Annealing for this purpose covers principally the low carbon wires, *i. e.*, with carbon 0.25 per cent and under. (2) To refine the grain, applied principally to the higher carbon rods and wires, *i. e.*, with carbon 0.30 per cent and over. (3) To obtain a definite structure in the finished material, applied principally to the higher carbon wires, *i. e.*, with carbon 0.30 per cent and over.

The first class of annealing to be described covers low carbon steel which, under the microscope, shows a structure consisting chiefly of a mass of grains of iron interspersed with dark patches. These dark patches contain practically all of the carbon of the steel in the form of iron carbide. The other ingredients of ordinary steels, such as manganese, sulphur, silicon and phosphorus, are not satisfactorily detected by the microscope; and, as they do not affect the structure of the steel appreciably, their effect may be neglected in this study of heat treatments, which is chiefly concerned with structure.

Fig. 1 shows a photomicrograph of a small section of a specimen of an 0.08 per cent carbon steel with a magnification of 100. The lighter grains occupying the greater portion of the area are iron, while the black areas contain the iron carbide (Fe_3C). As a matter of fact, these dark areas are made up of plates of extreme thinness of iron carbide alternating with similar thin plates of iron, and forming together a constituent characteristic of annealed steel, known to metallographists as "pearlite". This structure is apparent only with very high magnification and is shown more clearly in Fig. 7.

When a steel wire rod of the structure shown in Fig. 1 is subjected to the wire-drawing process, a marked change in the grain structure takes place. With each successive draft, the grains stretch out in the direction of drafting until a point is reached when the grains have been elongated to the limit of their ductility. If subjected to further strain by further drafting, they will part and the wire will break. Before this brittle condition is reached, therefore, it is necessary to heat-treat the wire by subjecting it to what is known in the wire business as a process annealing.

The effect of wire drawing in elongating the structural grain of the steel may be seen by comparing Figs. 1, 2 and 3. Fig. 1 shows the structure of the rod before drawing; Fig. 2 shows the structure after a 15 per cent reduction from the rod; and Fig. 3, the structure after a 60 per cent reduction from the rod. All of these photographs represent sections taken from a plane parallel to the axis of the rod or wire, not cross-sections. The reason for the marked difference in grain shown in Figs. 1 and 3 may be grasped more clearly when it is appreciated that Fig. 3 represents a wire reduced in the wire-drawing process to such a degree that it has become elongated 2-1/3 times the original length of the rod.

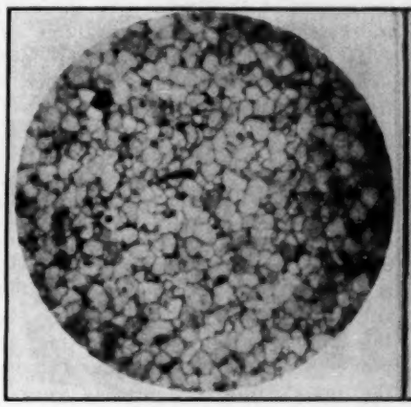


FIG. 1—ANNEALED 0.08 CARBON STEEL

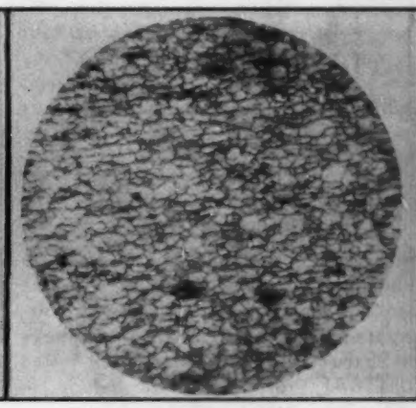


FIG. 2—WIRE 0.08 CARBON GIVEN ONE DRAFT

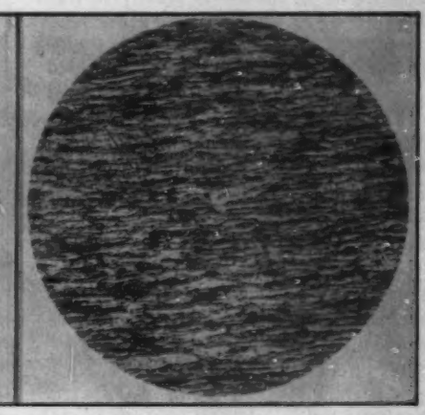


FIG. 3—WIRE 0.08 CARBON GIVEN SEVERAL DRAFTS

Process or works annealing consists in heating the wire to a certain temperature, maintaining such temperature until the entire mass of steel is thoroughly heated through, and finally cooling down. Practically all prominent authorities on the metallurgy of steel state that the temperature of annealing must be above the critical temperature, which briefly defined is that range of temperature above which the iron and iron carbide are mutually in solid solution. Few of our authorities, however, seem to recognize the fact that in the most common of all annealing of steel wire—that to remove the effects of cold work such as drawing—it is not necessary to

Presented at the May meeting of the American Iron & Steel Institute. The author, John F. Tinsley, is superintendent of the South Works of the American Steel & Wire Co., Worcester, Mass.

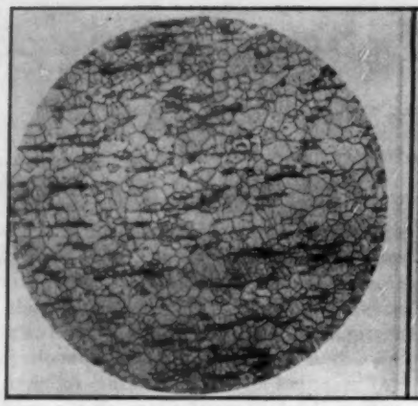


FIG. 4—WIRE 0.08 CARBON HARD DRAWN AND ANNEALED BELOW CRITICAL TEMPERATURE

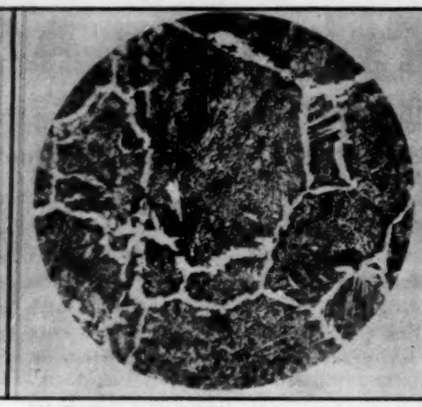


FIG. 5—WIRE 0.45 CARBON OVERHEATED

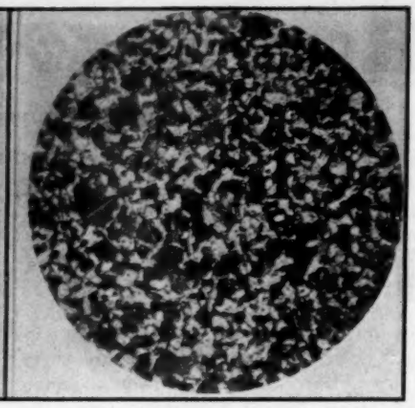


FIG. 6—ANNEALED 0.45 CARBON STEEL

reach the critical temperature, which is 1,300 degrees Fahr., or higher, depending on the carbon content. A temperature of 1,100 degrees Fahr. is entirely sufficient to relieve the strained condition of the grain shown in Fig. 3.

Fig. 4 shows the same wire that is depicted in Fig. 3 after annealing at a temperature below the critical point.

In the annealing process the strained and elongated grains shown in Fig. 3 break up and re-arrange themselves to form a new grain structure, as shown in the photograph. The annealed steel of the structure shown is now in excellent condition to withstand further cold work in reducing it to finer sizes; or, if already at finished size, is in good condition to meet the demands of annealed wire service.

The effect of reduction of section incident to wire-drawing on the tensile strength and ductility of steel wire, and the marked change brought about in these characteristics by annealing, as just outlined, is shown in Table I. This table is based on drafting and annealing practice in reducing a low carbon steel—in this case a 0.10 per cent carbon steel rod—to a fine size of wire. And it will be noted that between 80 and 90 per cent reduction from the rod or annealed wire can be taken before annealing is necessary. In cold-drawing from a soft rod or annealed wire, the heavier drafts can be taken when the material is in a relatively soft condition. The smaller the wire section, the smaller the amount of reduction that can be taken, due to the reduced ductility of the wire and to its consequently lessened ability to withstand the heavy strains put upon the wire in pulling it down through the die. It should be understood, of course, that wire-drawing practice is based also on other important conditions, such as speed of drawing and die lubricant, as well as fundamental conditions relative to the size and uniformity of the rod, thoroughness of acid cleaning to remove the hard scale of ordinary hot-rolled rods, and thoroughness of baking to remove the acid brittleness consequent to the cleaning process.

In describing annealing to remove the effect of cold work incident to drawing, emphasis has been laid upon the fact that, to secure structure well suited to withstand further drawing, or in the case of finished wire to meet ordinary requirements for annealed wire, it is not necessary to employ temperatures above the critical range. However, the structure obtained in this manner is not quite the same as that obtained when the steel is annealed at temperatures above the critical range, nor are the physical properties of the same wire subjected to these two different annealings exactly the same. In the latter form of annealing we would obtain what is termed in the wire mill a dead soft annealing, which is required for certain classes of finished wire subjected to very severe heading or upsetting operations.

The effect of dead soft annealing upon the physical properties of wire is shown below the process annealing column in Table I. The reason for this difference is that in heating beyond the critical temperature range, the pre-existing structure is entirely obliterated, due to the iron and iron carbide going into solid solution and in cooling down forming a new structure. On the other hand, in annealing below the critical temperature the pre-existing structure is simply broken up and re-arranged, but not entirely obliterated, and the deformation in-

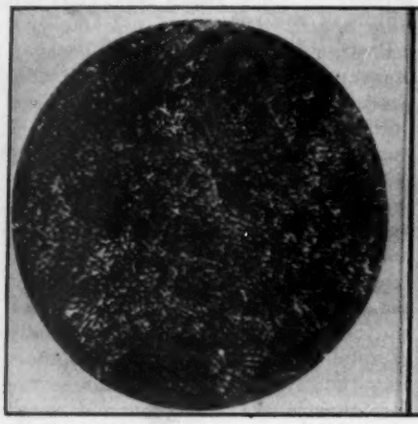


FIG. 7—ANNEALED 0.85 CARBON STEEL

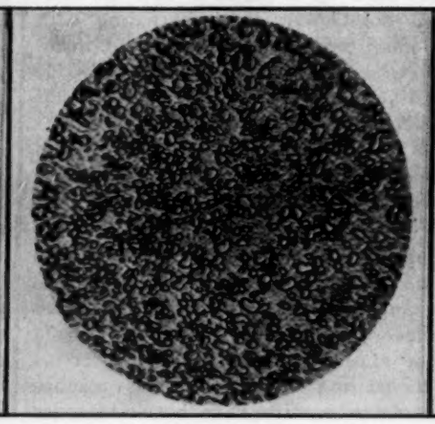


FIG. 8—STEEL 0.85 CARBON ANNEALED SPECIALLY FOR GLOBULAR STRUCTURE

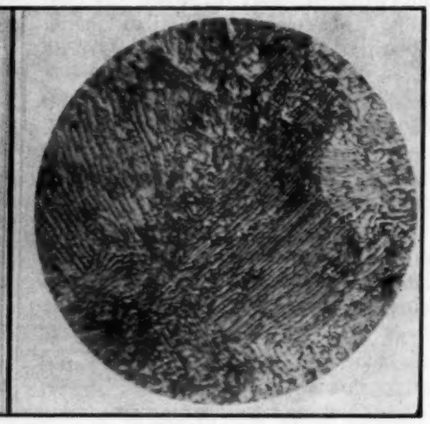


FIG. 9—PATENTED 0.85 CARBON STEEL

troduced by the cold work is thus not entirely removed.

In the annealing of low carbon steel wire, the rate of cooling from the annealing temperature is of little consequence as affecting structure, a fact which is much appreciated in the wire industry.

Theoretically, the ideal structure would be obtained if the entire rod could be finished at about the critical temperature. But this is, of course, impracticable, for the reason that it is impossible to regulate the finishing temperatures so closely, and for the additional reason that there is, necessarily, particularly in rolling very long lengths of very small sections, a marked difference between the finishing temperatures of the first and last end of a rod. The higher the finishing temperatures above the critical range, the coarser the grain, and the coarser the grain, the more does the steel lack the qualities that give it value. In order to destroy the coarse or uneven structure that may be created as just described, it is necessary to anneal the steel by heating it just above its critical temperature and slowly cooling it down. Above this range the coarse crystalline structure which previously existed is entirely obliterated, due to the iron and iron carbide going into solid solution, in exactly the same manner as was described in connection with the dead soft annealing of low carbon wire. The effect of overheating in coarsening the grain structure of a 0.45 per cent carbon steel and the refining influence of this type of annealing is shown in Figs. 5 and 6.

Wire May Be Made with Definite Structure

The third and last class of annealing to be described—that to obtain definite structure—is one of comparatively recent development in the steel wire industry and one which promises to be of considerable value. It is now well known that the mechanical properties of a wire depend in great measure upon the structure of the material, and that it is beyond the scope of chemical analysis to reveal a knowledge of structure. The workability, so to speak, of a wire for certain purposes is primarily dependent upon a physical condition of the steel. It becomes apparent, therefore, that through the use of heat treatment scientifically applied and controlled there is opened a field of unusual opportunity. In this line very little could be done prior to the application of the microscope and pyrometer to the study of the practical problems of wire manufacture.

Figs. 7 and 8 illustrate excellently this special type of annealing. These photographs show the structures of two annealed pieces of the same coil of high carbon wire, in which the annealing temperature of the one specimen was 1,300 degrees Fahr., and of the other 1,250 degrees Fahr. It is impossible to identify the structure by a simple observation of the fracture, which is the ordinary rough and ready method; nor is it possible to regulate annealing temperatures so closely without the use of pyrometers.

In passing to the next great class of heat treatment applied to steel wire, patenting, it is interesting to note that we likewise pass to another class of wire as regards grading by carbon content. As has been previously pointed out, annealing covers primarily the lower carbon steel wires, with special and restricted application to the medium and higher carbon

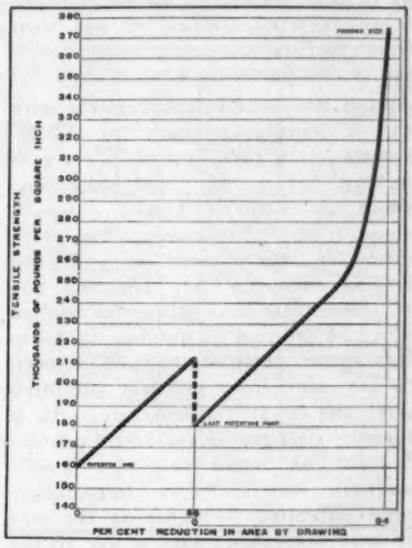


FIG. 10 — INCREASE IN TENSILE STRENGTH DUE TO DRAWING AND PATENTING

steels, while patenting naturally covers the medium carbon steels, being employed chiefly on carbons between 0.35 and 0.85 per cent. In low carbon wires, softness and ductility are the qualities desired both in order to facilitate the working of the metal, and, except in the case of hard drawn wires, in order to make the finished material of commercial and practical value. In the medium carbon steel wires, on the other hand, strength and toughness are required for both process and finished wire. Patenting makes possible this combination of strength and toughness, and to this process is due in large measure a broad field of application for steel wire.

From a tonnage standpoint, wire rope is the most important product of this class of heat treatment. In some respects it is the most important from a quality viewpoint, for the reason that in the manifold uses of wire rope the safety of human life is of vital consequence. Another important class of wire dependent for its superior quality upon the patenting process is music wire for pianos and other stringed instruments. In order to have tone and hold pitch music wire must possess extremely high tensile strength and must also have suitable physical properties to enable it to be applied in the instrument. By a proper combination of drafting and patenting it is possible to obtain music wire from a 0.70 per cent carbon steel which will have a tensile strength of 400,000 pounds per square inch, and be sufficiently tough to be wrapped about itself without breaking, and be swaged flat to one-half its original thickness without splitting. Through this remarkable combination of properties, which in steel are usually antagonistic, music wire may justly be said to represent the highest development in the manufacture of wire. Without the patenting process, as we know it today, it would be impossible to produce wire of such characteristics.

Why Patented Wire is Strong

The high strength and toughness of patented wire are due to its carbon condition and to its peculiar structure. The first step in the patenting process is to heat the wire to a temperature above its critical range. As previously explained, when steel is heated above its critical temperature the iron and iron carbide go into a solid solution. This, of course, causes the carbide of iron to become homogeneously distributed. In patenting, the degree of heating is regulated according to the carbon content of the steel, the size of rod or wire, and the time the material is subjected to the heat. After sufficient heating, the next step is to cool the material rapidly below its critical range, the structure obtained depending upon the rate of cooling. In practice, patenting is usually conducted as a continuous operation, the wire being led through the heated tubes of a furnace and cooled by being brought into the air or into a bath of molten lead comparatively cool, but seldom under 700 degrees Fahr.

A better understanding of the structure of a patented wire may be had by a comparison of the structure obtained by slow and by rapid cooling. If the steel after being heated is allowed to cool slowly through the critical temperature range, the homogeneous pre-existing solid solution of iron and iron carbide separates into a heterogeneous mixture of two constituents, resulting in the plate-like

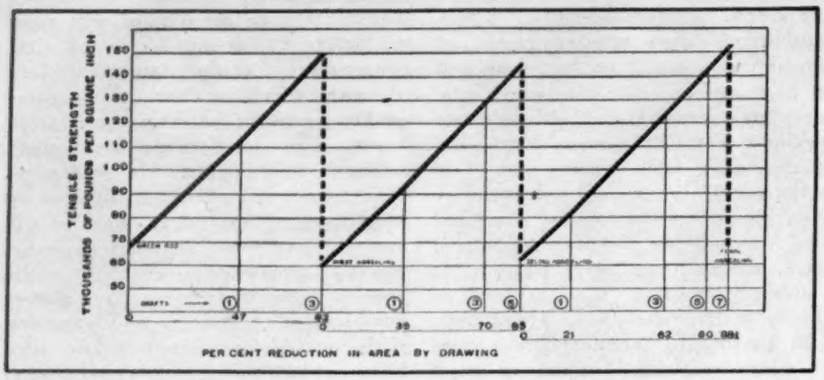


FIG. 11—CHANGES IN TENSILE STRENGTH DUE TO DRAWING AND ANNEALING

structure called "pearlite", in which, as described previously, iron and iron carbide arrange themselves independently in alternate thin plates. In the patented wire structure, on the other hand, the cooling through the criticial temperature range is too rapid to permit the separation of the iron and iron carbide into this plate-like structure. In a patented wire, part of the carbide of iron is in solid solution and the remainder, while not in solid solution, has not had time to form into plates. The difference in structure between slow and rapid cooling is seen in Figs. 7 and 8.

Sorbite Structure

The photomicrograph of the patented wire shows, as a result of the rapid cooling, a structure that might be termed nondescript. Metallographists will recognize the structure as sorbite, which, in the cooling of the higher carbon steels from above the critical temperature, is that stage of transition just preceding the pearlitic, the final condition of annealed steel, as shown in Fig. 7. The patented wire, therefore, represents an unsegregated condition as against the segregated or coarsely laminated structure of annealed wire. The high tensile strength of patented wire is due to the amount of carbon in solution, and its toughness to the fineness of the grain structure.

Patenting serves two important functions in the wire business: (1) In the process of manufacture, the removal of the effects of cold work, such as drawing. (2) In the finished wire, to give in conjunction with cold drawing, the required combination of strength and toughness.

Table II represents typical practice in manufacturing a certain wire of 0.50 per cent carbon steel from a No. 5 gage (0.207 inch) rod to a finished size of 0.02 inch. The rod in question as it came from the rolling mill had a tensile strength of 95,000 pounds per square inch and an elongation of 10 per cent. After the first draft of 28½ per cent, there is an increase in tensile strength of 27,0000 pounds per square inch, and the elongation is reduced to 2.9 per cent. After the first patenting of the wire it has a tensile strength of 115,000 pounds per square inch and an elongation of 8.2 per cent. It is then subjected to four drafts, being thereby reduced 65 per cent from the first patenting point before the second patenting is necessary.

After the second patenting, the wire has a tensile strength of 128,000 pounds. It is then drafted 76 per cent further before the final patenting, which leaves the wire with a tensile strength of 156,000 pounds. The properties of the finished wire depend largely upon this last patenting and the subsequent drawing to the finished size. In the case in question the wire was drawn three drafts and reduced 66 per cent from the last patenting size, ending at finished size with a tensile strength of 218,000 pounds. It will be noted that the tensile strength of the wire immediately after patenting is higher as the size of wire decreases. This is due to the fact that in practice the smaller the wire, the more quickly it cools, and consequently the greater the amount of carbon in solution. This, as explained previously, is the condition of a patented wire that makes for its strength.

In Table II and the note thereto are given the corresponding tensile strength and elongation of the same wire when patented and when annealed. It will be seen that the tensile strength of the annealed wire is 70,000 pounds per square inch, as against 115,000 pounds per square inch of the patented wire. This is due to the fact that, on account of the comparatively slow cooling in annealing, none of the carbon of the steel is in solution. It might be supposed that, owing to its being softer and of higher elongation, the annealed steel would withstand a further degree of drafting than the patented steel. On the contrary, however, on account of the rapid loss of ductility characteristic of the annealed wire structure, the annealed structure will not withstand drawing to anywhere near the same degree as will the patented structure. Generally speaking, the patented wire structure has more than twice the ductility of the annealed.

Fig. 12 shows graphically the increase of tensile strength in cold drawing from a rod of 0.50 per cent carbon steel, wire 0.02 inch in diameter and the effect of patenting in removing the results of the cold work. It indicates also the importance of the patenting process in creating a structure that permits an increase, by heavy drafting, of 50,000 pounds per square inch in tensile strength, and leaves in the finished wire a remarkable degree of toughness rather than brittleness. Incidentally, it may be noted from this chart that the same regular increase in tensile strength, due to drawing, is characteristic of the higher carbon steels as of the lower carbon steels previously shown.

Fig. 10 shows a typical practice in

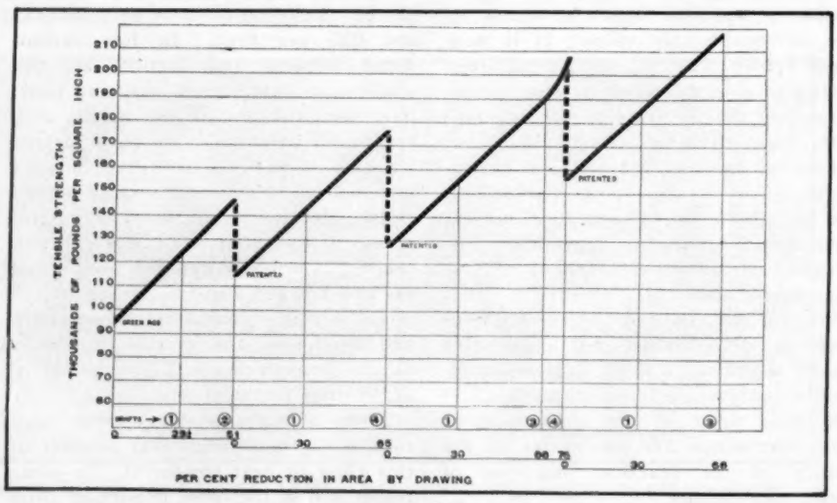


FIG. 12—VARIATIONS IN PHYSICAL STRUCTURE DUE TO DRAWING AND PATENTING

obtaining a tensile strength of 375,000 pounds per square inch in a music wire 0.03 inch diameter from a patented rod 0.192 inch in diameter, of 0.70 per cent carbon. It indicates the marked increase in tensile strength from the last patenting point, and emphasizes the remarkable character of a wire of such strength possessing the workable properties necessary for music wire. It will be seen that from the last patenting point the wire is reduced about 94 per cent, *i. e.*, elongated 18 times its length, and to do this on the wire in question, 19 drafts were taken. The increase in tensile strength per square inch, due to this heavy drafting, amounts to about 200,000 pounds from the last patenting point. In the final drafts there is an enormous increase of tensile strength. In fact, as the curve shows, a certain reduction towards the end increases the tensile strength much more than an equal reduction near the patenting point. One might think a wire made according to the above practice would be as brittle as a clay pipe stem; but, on the contrary, it is singularly tough, and stands wrapping, bending and flattening to a truly remarkable degree.

Outside of the manufacture of wire, hardening and tempering are usually separate and distinct operations. But in wire making the two terms always go together, there being practically no field of usefulness for wire simply hardened. It naturally follows, therefore, that in wire making, hardening and tempering should be conducted usually as a continuous process. In the making of tempered wire, the material is first run through the heated tubes of a furnace, then quenched quickly in a bath of oil or water, then run into the tempering bath of, say, molten lead, each wire being in continuous motion from the time it enters the heating furnace until it is wound on a reel. Such wire products as springs made of untempered wire, hardened and tempered after forming, do not, of course, have the several steps conducted as a continuous process, but there is no difference in essential principles.

In the development of the subject matter of this paper, for the purpose of associating readily the various classes of wire with the several heat treatments, annealing has been shown to cover primarily the low carbon steels, and patenting, the medium carbon steels. It follows naturally that hardening and tempering should apply to the higher carbon steel wires—those in which the carbon range is from 0.65 to 1.00 per cent.

In hardening wire, the first step is identical with that previously described for patenting, and is accomplished in practically the same manner. That is, the wire is heated above the critical temperature to enable the iron and iron carbide constituents to go into solid solution before quenching. After quenching, the steel, on account of its sudden cooling through the critical temperature, is hard and brittle. Cooling in this manner is too rapid to permit the segregation of the constituents, iron and iron carbide; and, as a result, considerable of the carbon content is in solid solution, the amount depending upon the total carbon in the steel and the rate of cooling. In the discussion of patenting it was pointed out that carbon in solution causes hardness in the wire. And it will be apparent that in hardening, as above defined, the amount of carbon held in solution will be much greater than in the patenting process, due to the much more rapid rate of cooling through the critical temperature, secured by the use of a quenching bath of low temperature. The structure thus obtained in the hardened wire depends on the rate of cooling. Small sections will be martensite—containing most of the iron carbide in solution; larger sections will be troostite—containing less iron carbide in solution; still larger sections will be sorbite—containing still less iron carbide in solution.

Besides martensite, troostite and sorbite, there are many intermediate transition structures formed by the different cooling rates of sections of different sizes. The hardened material contains more iron carbide in solution than is desired in the finished hardened and tempered wire, that is, the hardened wire is harder than is desired. The hardness is finally lowered to the desired degree or temper by carefully adjusting the temperature of the tempering bath.

In tempering wire for the greatest desired hardness, the temperature of the bath may be as low as 400 degrees Fahr. Tempering heats between this and 1,200 degrees Fahr. give practically any desired hardness. In passing, it may be stated that the field of commercial tempered wire requirements is such as to necessitate a wide range of temperature on the various quenching baths in the tempering room of a wire mill. In general, the reheating incident to tempering is usually considerably below the critical temperature.

Fig. 13 shows the loss of hardness due to tempering carbon steel at varying temperatures. The horizontal distances represent the tempering temperature, and the vertical distances the hardness by the Brinell test. The plotted curves are based on actual tests of spring stock of practically the same analysis and grade of steel as regards manganese, sulphur, phosphorus and silicon, while the carbons vary from 0.30 to 1.10 per cent.

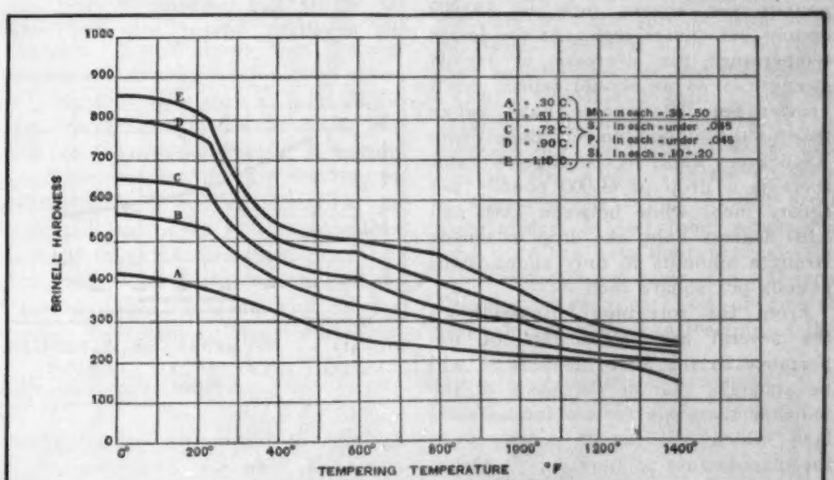


FIG. 13—TEMPERATURE—HARDNESS CURVES

It will be noticed that there is a marked loss of hardness on all wires tested between the temperatures of 200 and 600 degrees Fahr., the most marked loss being between 200 and 400 degrees Fahr., and that the higher the carbon, the greater the loss of hardness, especially at the lower temperatures. Furthermore, it will be seen that at 1,300 degrees Fahr. the hardness of all the samples is practically the same, irrespective of carbon content. In fact, at this temperature even the highest carbon wire shown is relatively soft and ductile and may be drawn several drafts. Thus it is possible to obtain in any steel, within the limits imposed by its carbon content, any desired temper, whether it be extremely high or correspondingly low. Of the various classes of hardened and tempered wires, razor blade represents the highest temper, band

Table I

VARIATION IN PHYSICAL PROPERTIES DUE TO DRAWING AND PROCESS ANNEALING

Condition of material.	Green rod No. 5 Ga. 207 in.	1st draft.	3rd draft.	Process annealed.	1st draft.	3rd draft.	5th draft.	Process annealed.	1st draft.	3rd draft.	5th draft.	7th draft.	Annealed.
Per cent reduction by drawing	0	47	82	0	35	70	85	0	21	62	80½	88½	0
Tensile strength pounds per sq. in.	68,000	113,000	150,000	60,000	93,000	130,000	145,000	62,500	82,000	124,000	143,000	151,500	68,000
Per cent elongation in 10 inches	25	2½	1½	30	3	2	1½	28	3½	2	1½	1	25

saw and corset wire the medium temper, and spring wire the relatively low temper.

Fig. 14 gives the tensile strength of a hardened 0.70 per cent carbon wire at various tempering temperatures, from which the marked effect of tempering in affecting physical properties will be evident. With varying tempering temperatures between 500 and 1,100 degress Fahr., the tensile strength runs from about 340,000 pounds per square inch to 150,000 pounds per square inch. At the lower temperature the decrease in tensile strength is, as we should expect, much greater per 100 degrees Fahr. range than at the higher temperatures. From 500 degrees Fahr. to 600 degrees Fahr. there is a drop of 60,000 pounds per square inch; while between 1,000 and 1,100 degrees Fahr. the drop in tensile strength amounts to only about 10,000 pounds per square inch.

From the foregoing discussion of the several heat treatments of importance in the wire business it will be apparent that at the basis of the industry there are certain fundamental laws which govern all processes in the manufacture of steel wire, whether it be cold treatment incident to drawing or heat treatment incident to the various operations described herein. Like all natural laws, those governing the behavior of steel in the manufacture of wire are inexorable, and the results obtained depend primarily upon the determination of those laws and upon their proper recognition and consideration in actual practice. Herein lies the reason for the vast difference between wire mill practice of the past and that of the present. The heat treatments which are applied today with such beneficial results were known then, but the underlying laws governing them were not. The scrap and rejections in the wire mill, the lack of uniformity and the unsuitable quality of the product, and the complaints of customers were all too frequently ascribed to the "devil in the steel". With the establishment in the past few years in our colleges of broader courses for the study of the nature and behavior of steel, and the resultant advent into the steel

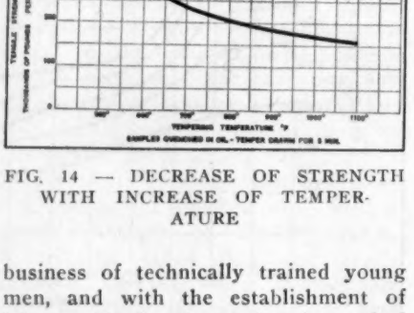


FIG. 14 — DECREASE OF STRENGTH WITH INCREASE OF TEMPERATURE

business of technically trained young men, and with the establishment of laboratories for the study of practical steel problems, with their invaluable aids in the shape of the microscope and the pyrometer, there has been given an impetus to a development in the steel wire business that has been unprecedented. The present-day wire mill, with its hundreds of pyrometers and automatic temperature regulating and recording apparatus, gives silent but forceful testimony to the passing of the old type of "practical" man whom Professor Sauveur has described as "the industrial Philistine clumsily standing in the way of scientific applications to industrial operations".

Men are Properly Trained

In the works with which I am associated, a physical laboratory for the study of heat treatments and other metallurgical problems connected with the manufacture of high-grade wire was established several years ago. A convincing proof of its practical value lies in the fact that the facilities for carrying on this work have been steadily increased. Today we have a large force of technically trained men in this laboratory, a costly and extensive equipment, and a separate building devoted entirely to the work.

Our physical laboratory is in every sense a practical and efficient adjunct to our producing department. Of fundamental importance in the practical application of the work of a laboratory of this kind, is the training of the men carrying on the work. To make their work of the greatest value, these men should be more than merely technically trained. We believe that the excellent results we have obtained in the heat treatment of wire are due in large measure to the fact that our laboratory men, in investigating a problem, study first all the conditions pertaining to the uses to which the product is to be put by the customer, and follow personally all investigations and experiments in the works' processes bearing on the subject.

In this way our laboratory men are made to recognize practical conditions, while our workmen become thoroughly trained as to the problem

(*Continued on page 984b*)

Table II

VARIATION IN PHYSICAL PROPERTIES DUE TO DRAWING AND PATENTING

Condition of material.	Green rod No. 5 Ga. 0.207 in.	1st. draft.	2nd draft.	Patented.	1st draft.	3rd draft.	4th draft.	Patented.	1st draft.	3rd draft.	4th draft.	Patented.	1st draft.	3rd draft.
Per cent reduction by drawing	0	28½	51	0	30	50½	65	0	30	66	76	0	30	66
Tensile strength, lbs. per sq. in.	95,000	122,000	146,000	115,000	143,000	163,000	176,000	128,000	156,000	190,000	208,000	156,000	184,000	218,000
Per cent elongation in 10 in.	10	2.9	2.8	8.2	2.8	2.7	2.6	7.8	2.0	1.9	1.8	6.0	2.0	1.9

Foundry Built in Limited Space

Description of New Shop of Westinghouse Air Brake Co. Which Has Many Interesting Features

BY ELLSWORTH TONKIN

THE development of locomotives of constantly increasing weight and tractive power, together with growth in the length of trains and the weight and capacity of cars, has resulted in demands upon the air brake apparatus necessitating the supply of a greater volume of compressed air than ever before. Also the present day railroad trains are equipped with a large number of auxiliary devices which consume compressed air. To meet this situation the Westinghouse Air Brake Co., Pittsburgh, has developed a new cross compound, locomotive type air compressor and other new devices for equipping modern trains.

To make the parts for these large compressors, a new gray iron foundry has been built at the East Pittsburgh works of the air brake company. It is called foundry No. 3, and in addition to the work mentioned above is used to take care of the surplus from two older foundries which have been in operation for a number of years.

In order to obtain the required floor space on a limited ground area, the building was made long and narrow and two stories high. The second floor is to be used for a core room but is built strong enough to be used as a molding floor in case there is a demand for more tonnage in the future. The experience of many years in air brake work, as well as the principles underlying the use of modern machinery were considered and embodied in the plans for the new foundry. Fig. 9 shows how Foundry No. 3 was erected over a shed which was used to take care of part of the overflow from the two old shops during the construction period. The work in the improvised foundry was not interrupted and was continued in the new building when it was completed and the old one torn down.

Foundry No. 3 is a two-story brick building, 300 feet long and 54 feet wide. The steel columns which support the traveling crane and jib crane runways, together with the second floor and roof, are partly incased in 18 x 36-inch brick pilasters. Between the pilasters on each floor is a 13-inch brick wall capped by a concrete sill 36 inches above the floor. Above the sill is solid steel window sash. Fig. 4 shows a section of the wall, sill and windows completed up to the second floor. To make the foundry as light as possible this construction is carried out between the columns all around the building except at certain points on the first floor where there are sliding steel doors which communicate with the yard or with other buildings. The first floor of the new shop is solid concrete and the second, which is 76 feet 1 inch above the first, is reinforced concrete. The concrete for the second floor was laid on false work. The second floor is supported by 5-foot 7 inch steel plate girders 54 feet long, which extend over the first floor between the columns. There are ten 15-inch I-beams between each set of girders and columns. The construction of the

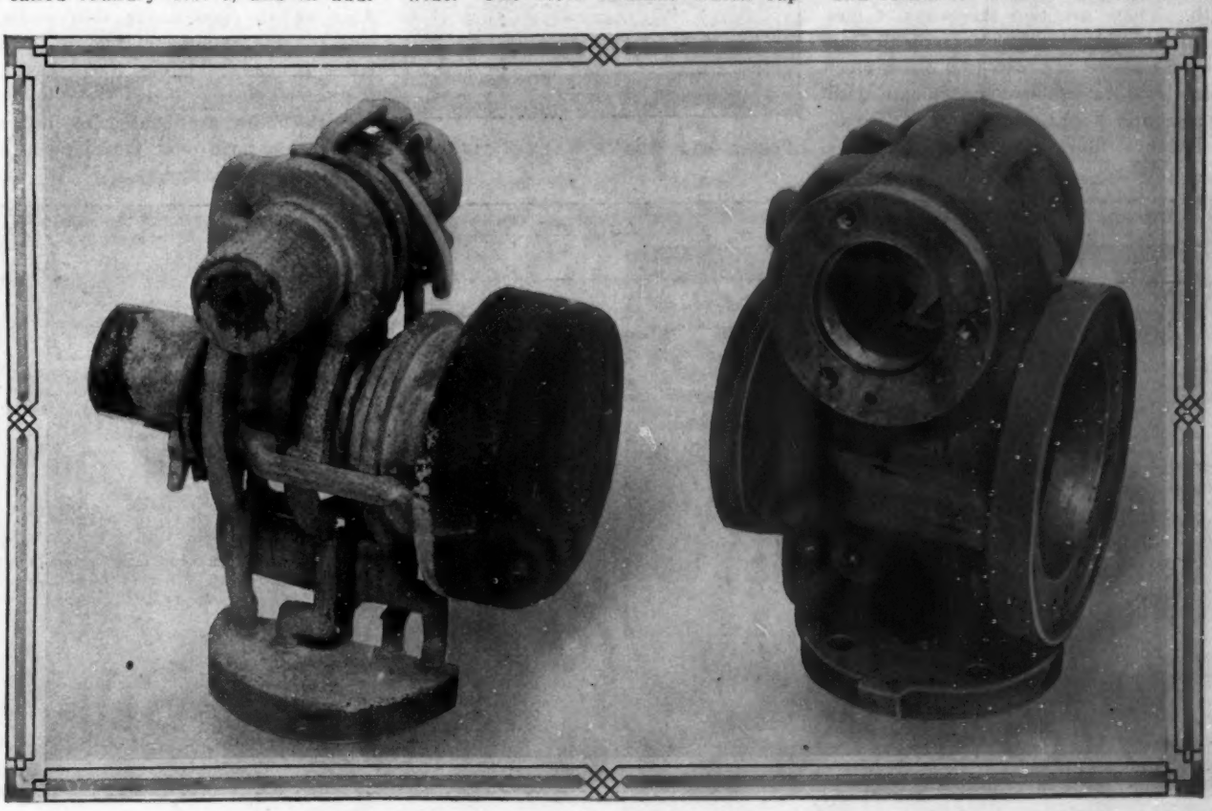


FIG. 1—CORES FOR UNIVERSAL T-VALVE TOGETHER WITH CASTING

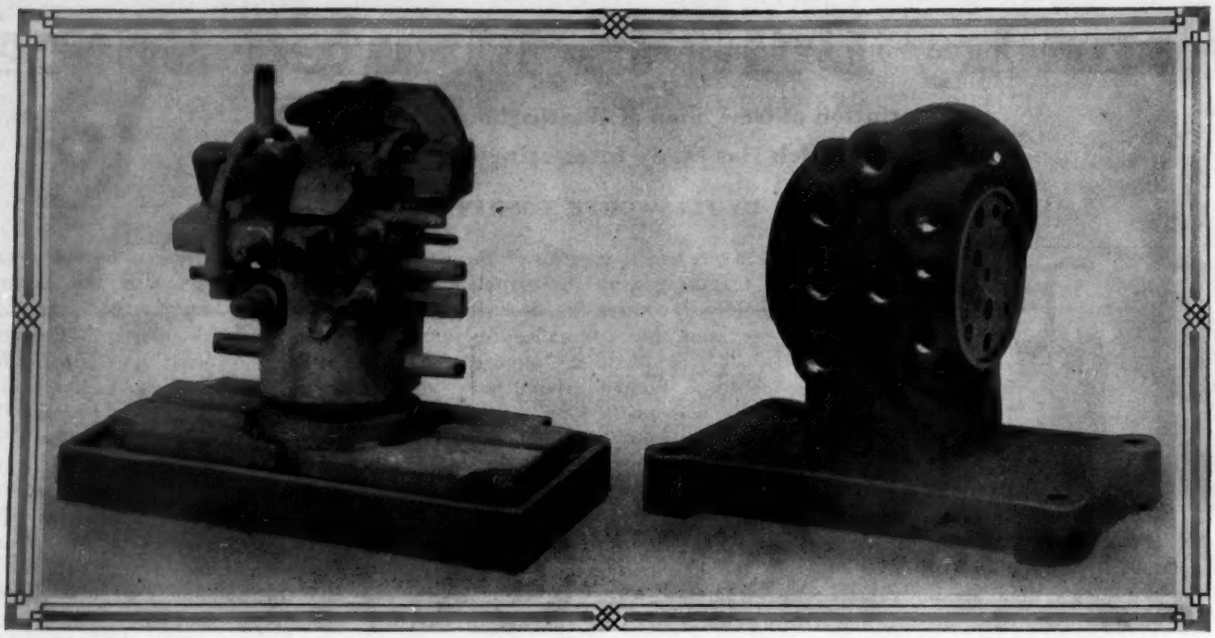


FIG. 2—INTRICATE CORES FOR UNIVERSAL VALVE, THREE FACE PIPE BRACKET, WITH CASTING

roof is illustrated by Fig. 5. A thin layer of reinforced concrete was laid on a false roof over which a single course of hollow tile covered by a coating of asbestos roofing was placed. The roof is supported by the steel trusses shown in Figs. 7 and 8. The sides of the ventilators and the partition between the molding floor and the cleaning room are formed with a cement mixture laid on steel lath. There are two stairways, 4 feet 6 inches wide, located as indicated in Fig. 6. There are also two 5-ton electric elevators which communicate with the second floor.

The first floor is ventilated by rows of hinged steel sash placed at the top and bottom of the large windows. The sash may be operated individually from the floor. There are also six 10 x 15-foot ventilators, Fig. 7, which run up through the second floor and extend far enough above the roof to have steel sash on each side, which are operated from the second floor. The second floor is ventilated by hinged sash operated from the floor and by continuous sash on both sides of the monitor in the roof. The latter is operated from four places on the second floor.

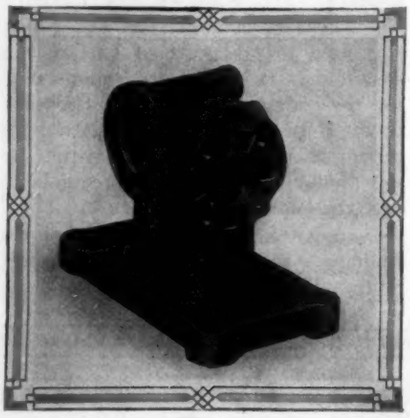


FIG. 3—AIR BRAKE VALVE CASTING

Both floors are heated by hot air, which is carried over steam pipes and

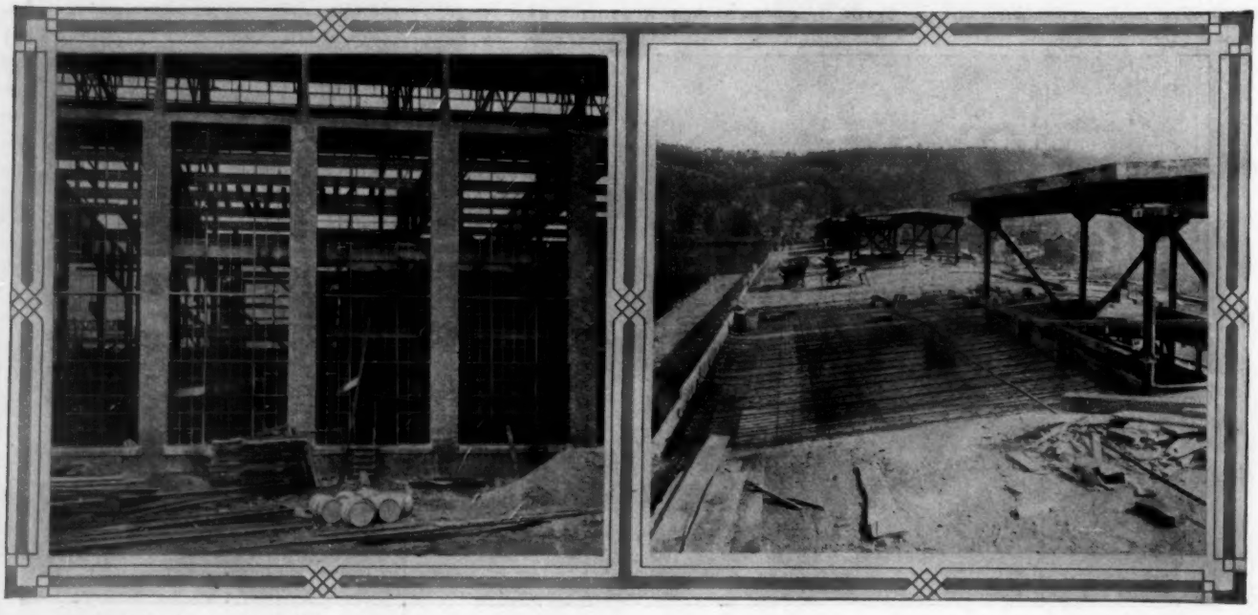


FIG. 4—THE WALLS ARE NEARLY ALL GLASS

FIG. 5—CONCRETE AND TILE ROOF

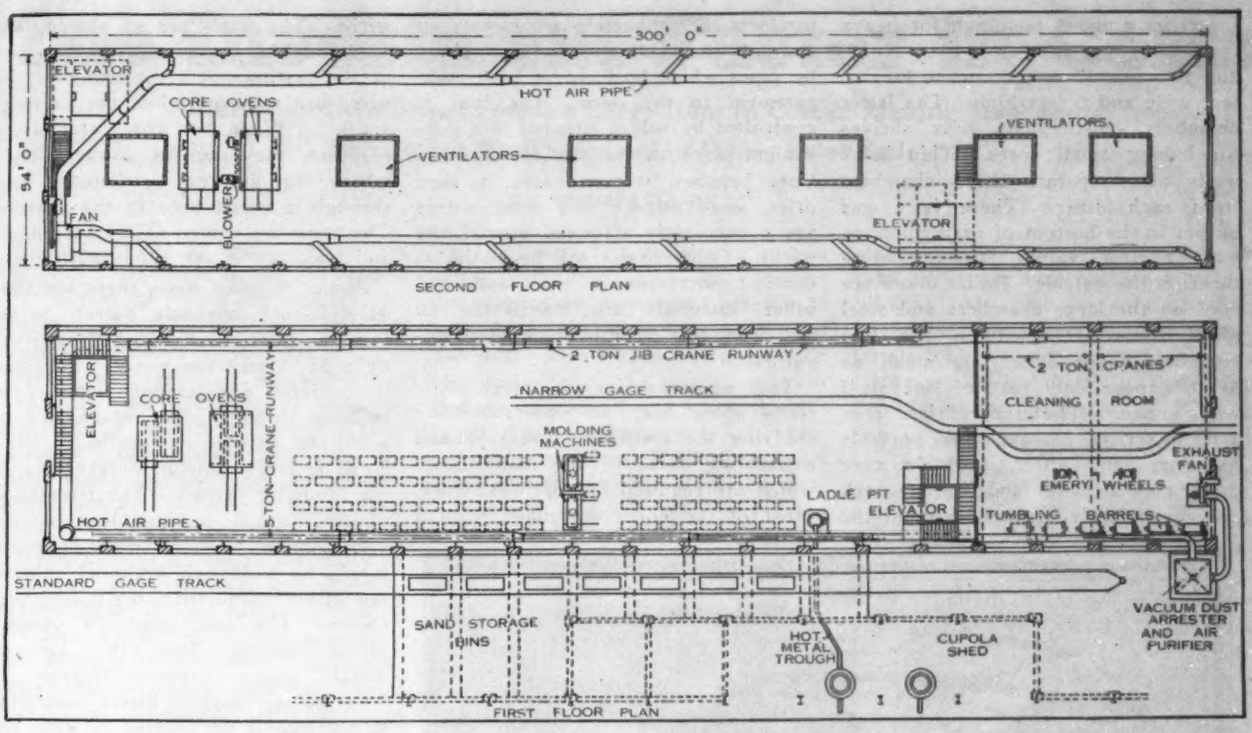


FIG. 6—PLAN OF FIRST AND SECOND FLOORS OF NEW WESTINGHOUSE FOUNDRY

through a 64-inch double outlet fan driven by a 50-horsepower motor located on the second floor. The air is distributed by four large galvanized steel pipes which run the full length of the building, as shown in Fig. 6. The steam for the heating system is furnished from the blacksmith shop exhaust line; live steam may be obtained from the boiler house when the blacksmith shop is not running.

The first floor is divided into two parts. The molding floor occupies 26 bays and the cleaning room the remaining four bays. These departments are connected by 10 x 10-foot double sliding steel doors. There is also a 9 x 10-foot double sliding steel door opening from the cleaning room to the elevator in the corner of the foundry floor, as illustrated by the plan of the first floor, Fig. 6.

The core department occupies one end of the first floor. Core oven No. 1 has two compartments, each 4 feet 6 inches wide, 10 feet long and 6 feet high, with thin brick partitions. Core oven No. 2 has four compartments, two of which are 4 feet 6 inches wide,

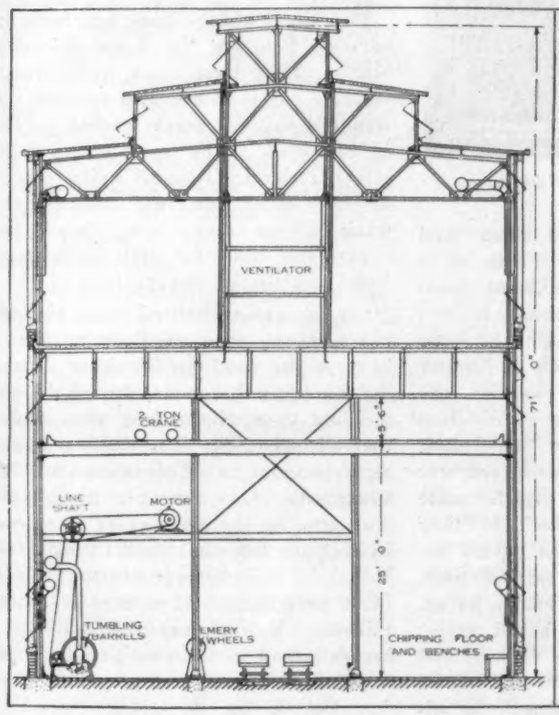


FIG. 7—SECTION THROUGH CLEANING ROOM

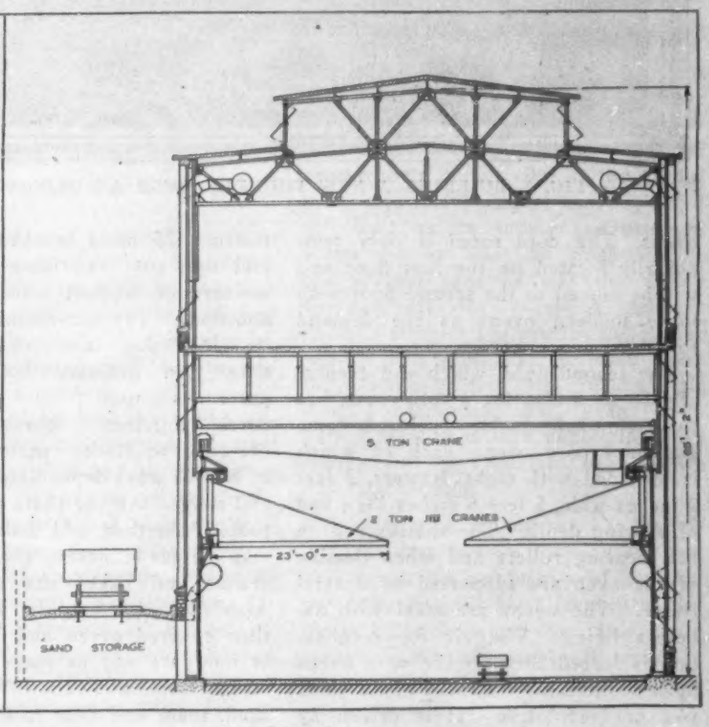


FIG. 8—SECTION THROUGH MOLDING ROOM

7 feet long and 6 feet high for heavy cores placed on cars as in oven No. 1, and two are 12 feet 6 inches long, 6 feet wide and 6 feet high. The latter chambers, on the side, have shelves for baking small cores. Thin brick walls also separate these chambers from each other. There is a gas burner in the bottom of each chamber, with control valves for regulating them on the outside. Roller doors are used on the large chambers and steel plate doors are used on the side chambers. The latter are small so as to expose only part of one shelf when open. The sand drier, core sand mixer, oil storage tank, portable gyrating sand sifter, portable core drier, core benches and storage rack are conveniently arranged around the ovens. The core room is only temporarily located on the first floor and will be moved to the second floor with more modern ovens as the demand for floor space grows.

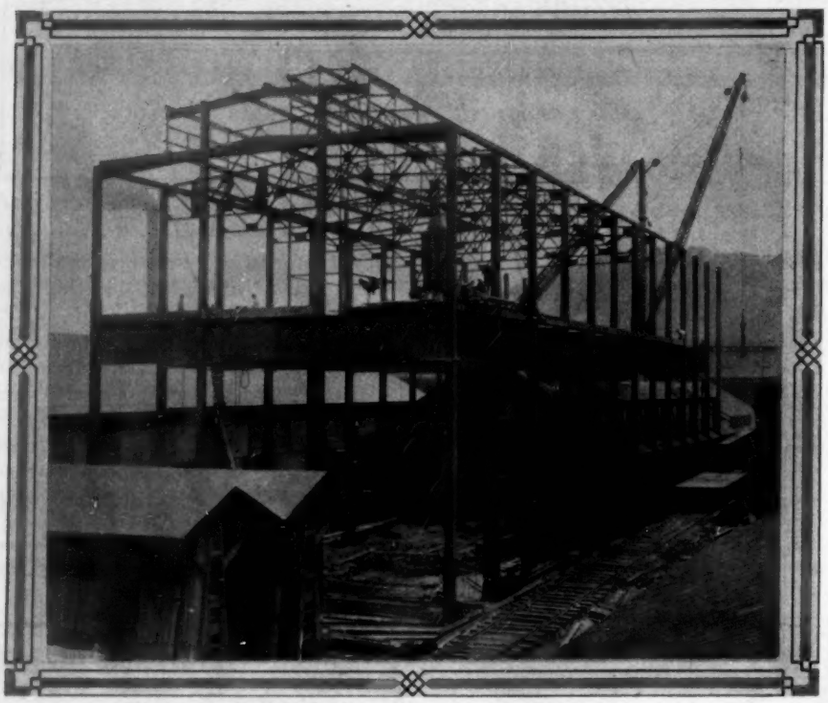


FIG. 9—BUILDING A NEW FOUNDRY OVER AN OLD ONE

The second floor, which will eventually be used also for a core room, has two sectional, double, enclosed flame gas fired core ovens, each of which is provided with eight drawers, 2 feet 9 inches wide, 5 feet 6 inches long and of varying depth. The shelves run on ball bearing rollers and when outside of the oven are supported by a steel frame. The ovens are steel with asbestos lining. The air for combustion is forced through the core ovens by a positive blower rated at 3.3 cubic feet per revolution. It is driven by a 6-horsepower motor with a belt. The products of combustion are carried up through the roof to the atmosphere by pipes which lead out of each compartment in the oven. The heat is controlled by valves situated in a convenient place on the side of the oven. Core benches, storage racks, a sand drier, sand mixers and sand sifters are conveniently arranged around the ovens. Other ovens will be added as demand increases. Core sand and other materials are transferred to and from this floor by two 5-ton elevators.

The necessity for so much core room space may be understood by studying the methods of making and assembling some of the many cores which are required for air brake work. Most of the cores are made from a mixture 75 parts washed silica sand and one part raw linseed oil, or a mixture of washed silica sand, loam and flour. The latter mixtures depend on the size and shape of the core. An ordinary flour and water paste is used for pasting the cores together. Cores consisting of two or more parts are made in several ways depending on their size and shape. All the parts may be made pasted together and baked; or they may be made baked, then pasted together and baked the second time. Also one part may be made, baked, then covered green and baked again; or one part may be made of sand and oil mixture and another part of a sand, loam and flour mixture. In addition, practically all of the cores are wired. The wires are so placed that they may be conveniently pulled out of the casting. A great many of the wires are removed while the castings are hot. When two cores are pasted together the joint is always made where the fin can be knocked out through a cored hole in the casting. The cores are vented as they are made and wax tapers are used sparingly.

In the cleaning room there are four 40 x 56-inch tumbling barrels belted to a line shaft overhead which is driven by a 35-horsepower motor. The dust is collected and carried outside the building through pipes which lead to a 300-unit vacuum dust collector. The latter is large enough to take care of six tumbling barrels. The circulation of air through the tumbling barrels, collector and 17-inch pipe is maintained by a 45-inch cycloidal exhaust fan direct connected to 6½-horsepower motor. The fan creates a vacuum of 3 ounces. Two W[illegible]nghouse double emery grinders driven by 5-horsepower motors direct connected to the wheels are located between the tumbling barrels on one side of the cleaning room. They are used for dressing small castings as they are taken from the tumbling barrels. The castings are then loaded on industrial cars [illegible]aken to the stock yard or mac[illegible] shop. The other side of the clea[illegible]ng room is equipped with pneumatic tools and benches for chipping and cleaning the larger castings. Two 2-ton overhead cranes, Fig. 6, are used for handling the heavy work in this department.

The sand storage bins are built in between Foundry No. 2 and Foundry No. 3. They have brick walls which separate the bins and also support the standard railroad track leading to the cupola shed. The roof is of reinforced concrete, I-beams being placed directly under the two rails of the track. Trap doors are placed between the rails for unloading sand from cars to the storage bins.

On account of limited space the cupolas in the shed of Foundry No. 2 have to be used for Foundry No. 3 by running a hot metal trough to the molding floor of the new shop under the railroad track. The melting equipment includes two Colliau cupolas with a capacity of 14 tons per hour each. The air for the cupolas is furnished by a blast fan on the charging floor belted to a 75-horsepower motor. A blast pressure of 12 ounces is maintained. The fuel, pig iron and scrap are delivered to the charging floor on standard railroad cars which are switched in on the track extending over the sand bins.

The Investment Factor in Costs

Interest on Investment Forms a Large Item in Cost of Making Steel and Should Not Be Overlooked in Fixing Sales Policy

BY THOMAS J BRAY

I BELIEVE that upon consideration it will be agreed by men of experience in the rolling mill and steel industries that the relative prices of steel products are at the present time the lowest recorded in the history of the trade. By relative prices of steel products is meant, of course, their present selling prices as compared with wages and the prices of various commodities. In other words, the number of hours of labor, the number of bushels of wheat, or tons of coal, that a ton of steel will now buy is less than at any former period.

During the periods of extremely low prices of 1893-1894, and 1895-1898, which old time steel men always recall when discussing hard times and low profits, the selling price of a gross ton of steel billets would buy, roughly speaking, about 140 hours of unskilled labor, while now it will buy little more than 100 hours. The selling price of a net ton of merchant bars would then buy about 170 hours of unskilled labor, while now it will buy about 115 hours. Expressed in terms of mechanical labor, or mining labor, or in coal, or in terms of great commodities like wheat and corn, or in terms of taxes paid per ton of steel produced by steel companies, the same condition holds good, that the relative prices of steel products in this country are now lower than ever before.

This low selling price of steel products not only brings pressure on operating heads to reduce costs, but also necessitates, on account of the narrow margin of profit, extreme care in making sales.

It is obvious that under these conditions the fact that tonnage can be taken at the current market price is not a sufficient guide for taking or refusing it, but regard must first be had to the cost of producing the material. The sales manager, or head of the company, or whoever has the last word in deciding day by day the prices to be put on products, or the length of time for which contracts shall be made, should have constantly before him complete cost data.

The sales manager, and other officers having to do with selling, should also, in considering sales at a narrow margin of profit, take into account the interest on investment per ton of each kind of product manufactured and sold. This was a matter of little importance when the total investment required was small and when the different steps in the process of manufacture from ore to finished steel were undertaken by separate companies and a profit was necessarily taken on each step. But with the integration of properties and processes

THOMAS J. BRAY,
President, Republic Iron & Steel Co.

there is a natural tendency to consider only one profit from ore to finished material; and it is obvious that unless this single profit is sufficient to give a fair return on the total investment the result will be, to say the least, disappointing.

To those of us who have had experience in the construction of steel plants, rolling mills and so on, during the past 20 years, one of the most impressive features has been the progressive increase from year to year in the cost of construction, which, of course, has meant a corresponding increase in the amount of money invested. Not only has the influence of higher wages and generally higher equipment costs made itself felt in higher construction costs, so that the plant built in the early nineties, or even ten years ago, could not be duplicated today for its original cost, but changes in processes, in raw materials and a variety of other causes have had their effect in increasing the investment factor.

The typical American steel plant of the decade ending in 1900 may be said to have been an acid Bessemer works, which on account of the then low price for fuel, could be operated economically with a very cheaply built power plant. This fact, together with the simplicity of the process itself, meant a low investment per ton of product produced. Due largely to the decreasing supply of low phosphorus ore, the typical American steel plant is now a basic open-hearth works. The investment per ton of ingots necessary to carry on the process from pig iron to ingots in a converter plant is about one-fifth of the investment per ton for the corresponding step in an open-hearth works. Thus the effect of the change of process on the investment factor is easily seen. It is true that it is sometimes maintained that, inasmuch as the ordinary open-hearth plant uses only say 60 per cent to 70 per cent of a ton of pig iron per ton of ingots, this lessened need for blast furnace capacity (pig iron being replaced by purchase scrap) might be considered as an offset to the higher investment in the open-hearth plant. But in my judgment this factor cannot be considered an offset, as the supply and price of scrap are at least as uncertain at the present time as was the ability to purchase for extended delivery cheap Bessemer pig iron in the earlier years. The fact that in some cases the Duplex process with its high pig iron consumption has been used, partly because of the uncertain scrap supply and its uncertain price, bears out this thought.

Furthermore, leaner ore has its effect on blast furnace tonnage, so that in general, the production of pig iron per cubic foot of blast furnace capacity is being lessened from this cause year by year, although this tendency may not be felt by those having ample supplies of rich ore.

It is also a fact that the large in-

Paper presented at May meeting of American Iron and Steel Institute by the president of the Republic Iron & Steel Co.

vestments in plants have brought with them and made advisable the investment of money in large reserves of ore and coal, and the equipment that goes with them. Common prudence has dictated that the large investment in modern plants should be backed up by a reserve of raw materials. This was not so necessary in the early days of the steel business, when the plant investment was small and the limits of bodies of desirable ore and coking coal, within reasonable transportation distances from steel producing centers, were not so well defined. Leaner ore has also meant investment in concentrating and washing plants, and as the proportion of ore mined from shafts increases as against that from open pits, larger investments may become necessary because of this fact.

Without attempting to give close figures, which, of course, differ widely with different conditions, but simply for illustrative purposes, let us consider a modern steel company of moderate size, producing, say, 400,000 net tons of open-hearth steel merchant bars and plates per year. Such a concern, if built up under present construction conditions, will probably, if provided with coking coal reserves for 25 years, have an investment in houses, coal shafts, mining equipment, coal reserves and by-product coke ovens, of from $7 to $10 per net ton of capacity of finished steel per year. In blast furnaces its investment will be from $8 to $10 per ton per year of finished steel. Its open-hearth plant, blooming mill and billet mill will entail an investment of from $13 to $15 per ton per year of finished steel. Its bar mills and plate mills will require an investment of $7 to $8 per ton per year of finished steel; while the working capital required will probably be from $10 to $12 per ton per year of finished product. I hesitate even to guess at the investment in real estate required per ton of finished steel, but it can easily run $1 to $2 per ton per year of finished product produced; while the consideration of the value of ore in the ground—depending as it does upon so many factors, like quality, cost of mining and transportation—would take a separate paper and for brevity is omitted. If part of the steel produced by the open-hearth plant, instead of going into bars or plates, goes into more highly finished products—like pipe, wire, sheets, tinplate, shafting, spikes or into fabricated structural work—the investment factor per ton per year for those products will be increased commensurate with the character of the product; or if part of the product is sold in the shape of billets, or sheet bar, the factor will be decreased for those products. In any case, the accountant can work out the investment factor per ton per year for each product along the lines indicated, taking into account the working capital required as well as the fixed investment.

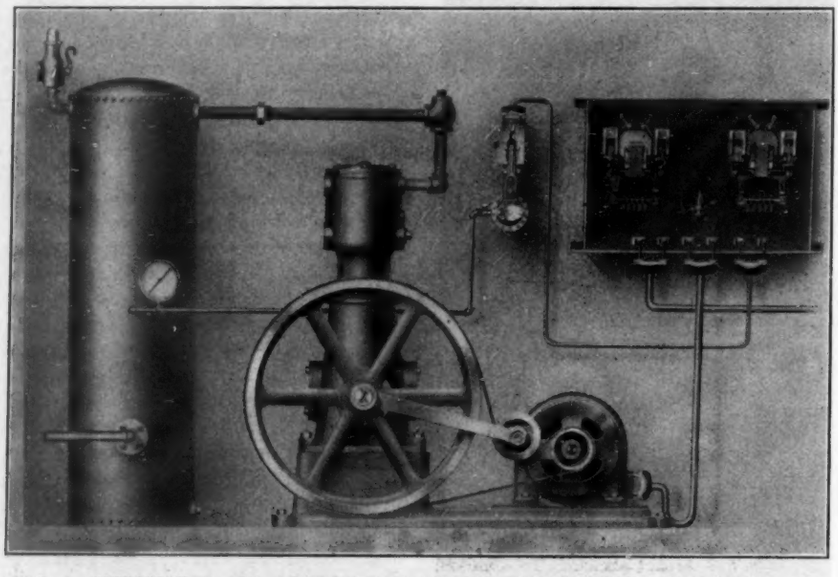


FIG. 1—AUTOMATIC AIR COMPRESSOR OUTFIT DESIGNED TO OPERATE CONTINUOUSLY OR INTERMITTENTLY

While the figures given above are intended merely to be illustrative, they are based on experience, and in the example cited, would show that without ore or transportation interests an investment factor of from $46 to $57 per ton per year is indicated. This would mean, taking the average of the two figures, $51.50, that to make 6 per cent on the actual money invested a profit above full and complete costs is needed of somewhat more than $3 per ton on each ton of steel sold. Of course, if the interest on investment on money tied up in ore operations and properties per ton of steel produced were added, this amount would be still higher.

I have tried to bring out briefly the importance of the investment factor in sales policy; but I realize that the stress of competition, the attempt to stimulate business by low prices and the effort to keep operating may at times prevent its consideration. This may be necessary in choosing the lesser of the two evils—that is, of closing down the works, or completely neglecting profits. But I believe that, even in hard times, the constant consideration of this factor together with true costs will at least tend to make the comparative prices of different steel products more in keeping with their relative cost and with the investment necessary to produce the products.

The statement made at the beginning of this paper concerning the relative prices of steel and rates of wages shows that the public has, on the whole, been well served by the steel industry, and that with higher wages, higher taxes, etc., steel prices have not been increased in proportion. There is also a duty to stockholders, and if constant consideration of the investment factor may not prevent ruinous prices for spot business, it is hoped that its consideration in sales policy will tend to minimize the extension of these prices over long periods.

Clayton Air Compressors

In the accompanying illustrations are shown various air compressing outfits developed by the Clayton Air Compressor Works, 115 Broadway, New York City. This equipment is adapted for use in various industrial operations requiring small amounts of compressed air and usually under conditions where a central source of air supply is not available or applicable. The compressors are of the vertical, high-speed, single-acting type, that is, for compressing on the up stroke only. All operating parts are enclosed and the machines are self-oiling. Being electrically operated, they can be installed without regard to the usual power source limitations, convenience to the work being the only consideration. In Fig. 1 is shown an automatic outfit which is designed to operate continuously or intermittently as required, to keep the receiver full of air at a predetermined pressure

and ready for instant use. It consists of a compressor, motor, air receiver and automatic starting and stopping device.

In Fig. 2 is shown an outfit similar to that illustrated in Fig. 1, but assembled on a portable truck. Fig. 3 shows an electrically-driven, two-stage outfit designed for working air pressures from 150 to 300 pounds per square inch. For service within these pressure limits it is claimed that this two-stage arrangement is better adapted and more efficient, and the power necessary to drive is considerably less than for single-stage compressor working under the same conditions.

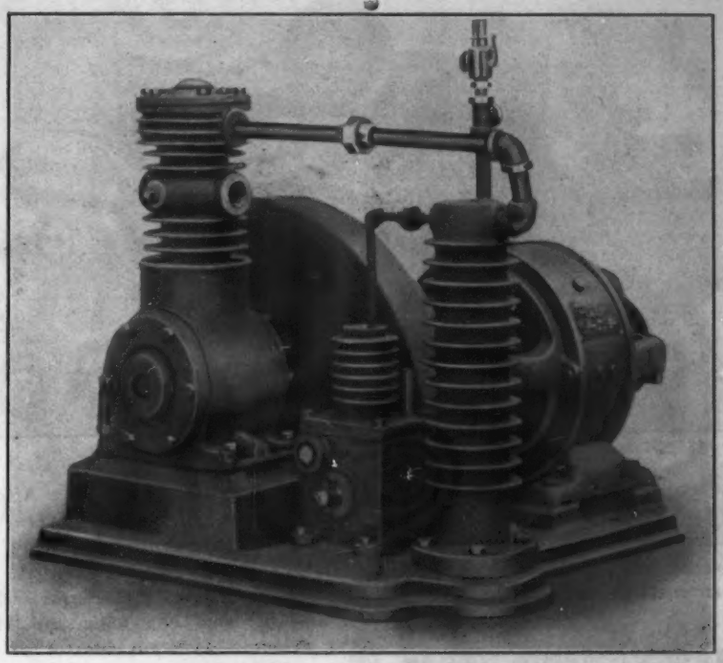


FIG. 3—TWO-STAGE AIR COMPRESSOR WITH ELECTRIC MOTOR MOUNTED ON ONE BASE

Book Review

Factory Organization and Administration, by Hugo Diemer, Pennsylvania State College, second edition, 1914, revised, enlarged and reset. Published by the McGraw-Hill Book Co. and furnished by THE IRON TRADE REVIEW for $3, net.

Whoever has to deal with office or works organization, management and systematization will find much of value in this book. It is the result of 20 years' experience, half as an employe and half as a consultant. The present form of the work has been acquired as the result of lecture courses to senior students in engineering colleges, and, while primarily intended for the actual practitioner in manufacturing work, it is of value to engineering students. The second edition presents the material in more logical sequence and new developments of the science of management have been added. Numbers and topical headings on the paragraphs aid greatly in referring to details and a comprehensive index assists in reference.

Too much matter is condensed into this volume to allow detailed mention, but it may be said broadly the author has gathered into a single volume the essence of a hundred treatises on the various subjects. Management, finance, organization and control, accounts, reports, factory, location and planning, employment of labor, shipping, time taking, costs, inventory, inspection, rate and time studies, wage systems, are some of the chapter headings.

Diagrams and reproductions of cards, blanks and forms are shown, illustrating graphically the subject matter.

The bibliography is a feature of great value to any student or reader who desires to go more deeply into any department. At the end of each chapter is given a list of works referring to that special subject, with definite reference to chapter and page. At the close of the work is given a classified biography of the entire volume as well as a suggested standard reference library of industrial management and engineering. In addition to this is a list containing titles of a comprehensive library of supplementary reading for a school of engineering or business administration or for a public library.

To the business man seeking to better his organization this volume offers an opportunity to become familiar with modern practice in this respect and points the way to more comprehensive reading along any special line that may be desired. Sufficient examples are given of actual methods to present one that may be adopted with slight changes to fit particular conditions in any individual business.

At a time when efficiency and careful planning of costs to meet competition have become so necessary this work presents to the older establishment an opportunity to compare its methods with modern practice and

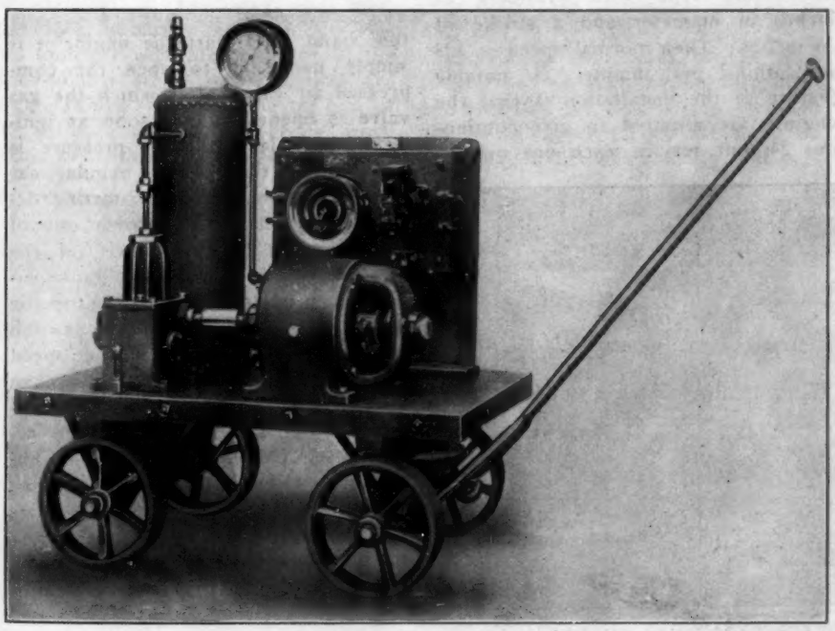
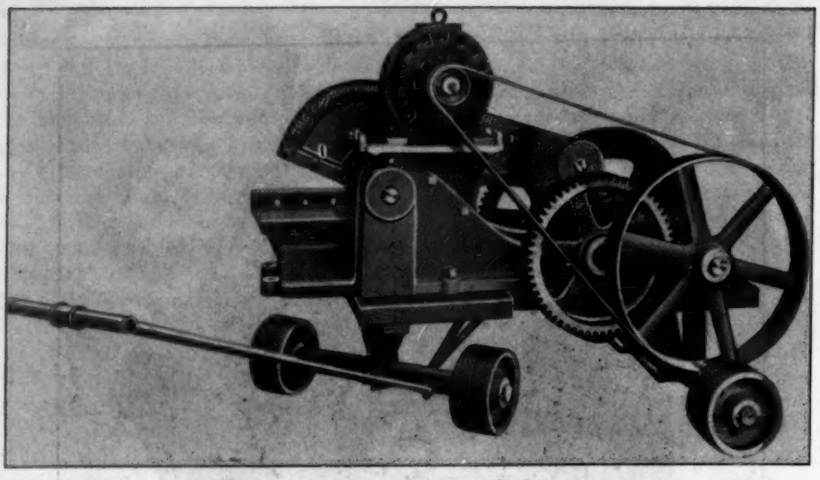


FIG. 2—AIR COMPRESSOR WITH RECEIVER, MOTOR, ETC., MOUNTED ON A TRUCK



PORTABLE MOTOR DRIVEN SHEAR

find where they can be made to bring about greater efficiency and reduction of costs, thus getting on a competitive equality with those who have modern methods already in service.

New Portable Shear

The accompanying illustration shows a new portable shear which has recently been placed on the market by The Canton Foundry & Machine Co., Canton, O. It is electrically driven and entirely self contained and is mounted on a four-wheel truck so that it may be easily shifted about the floor of the shop. A heavy fly-wheel on the pinion shaft furnishes the necessary energy to the knives at the moment of cutting. The truck is strongly braced, so that there is no vibration when the machine is in operation and all of the parts are liberally proportioned to insure a long life and avoid break-downs.

Mining Engineers Meet

The annual meeting of the Chicago section of the American Institute of Mining Engineers was held at the Sherman hotel recently. After a banquet, the following officers were elected for the ensuing year: Robert W. Hunt, chairman; J. A. Ede, consulting engineer for the Illinois Zinc Co., vice chairman, and Henry W. Nichols, assistant curator of geology, Field Museum of Natural History, Chicago, secretary-treasurer. The executive committee in addition to the above includes F. K. Copeland, president of the Sullivan Machinery Co., and G. M. Davidson, chemist and engineer of tests, Chicago & North Western Railway Co., Chicago.

Heavy Duty Gas Engine

The C. & G. Cooper Co., Mt. Vernon, O., has recently installed two 600-horsepower heavy duty gas engines in a power plant at Clarksburg, W. Va. Each engine drives an electric generator. The engines are of the horizontal, single-tandem, double acting type with cylinders 24 inches in diameter and a stroke of 36 inches. Their normal speed is 125 revolutions per minute. A notable feature of the installation is that the engines are required to give continuous 24-hour service, each one operating alternately for two week periods. The main lay shaft as shown in Fig. 1 carries the eccentrics which operate the inlet and exhaust valves. Through a set of helical gears, the main lay shaft also drives the small ignition shaft from which the ignitors and special multiple force feed cylinder lubricators are operated. The upper helical gear in this drive can be easily shifted longitudinally on the shaft and locked by means of a hand lever on the side of the gear case, thereby uniformly advancing or retarding all the ignition trips while the engine is running. The gas and air piping is arranged to form a stairway and platform, so that the operator may conveniently oil and inspect the inlet gear.

The engine is provided with simple starting mechanism, contained in a floor stand, Fig. 2. The gas, air starting and water valves, as well as the ignition switch are all located on this stand. To start the engine it is simply necessary to open the compressed air valve, after which the gas valve is opened and as soon as ignition takes place, the air pressure is replaced by that of the regular explosive mixture. The air starting device is automatically thrown out of service when the air valve on the throttle stand is closed. Each engine is provided with an automatic safety stop, which trips the switch in the ignition circuit if the speed becomes over 10 per cent more than normal. The success of these engines is due largely to a careful selection of metals suited to the exacting requirements of gas engine work and to a design which combines the elements of strength and simplicity with good workmanship. The accessibility of the working parts has received special attention in the design.

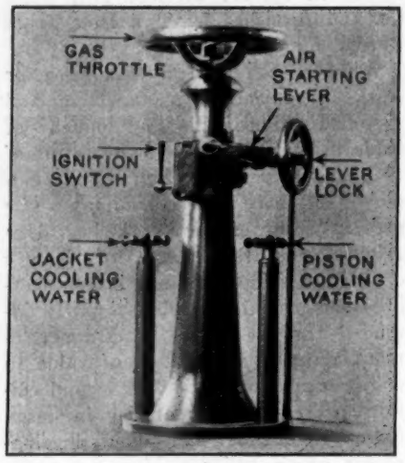


FIG. 2—STARTING MECHANISM

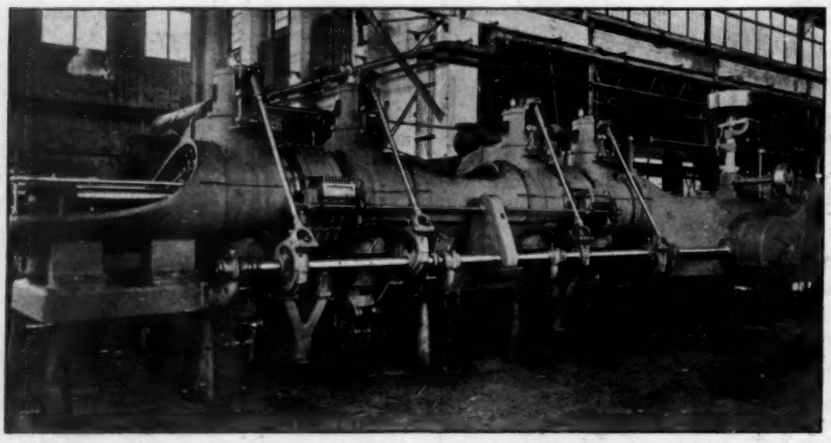
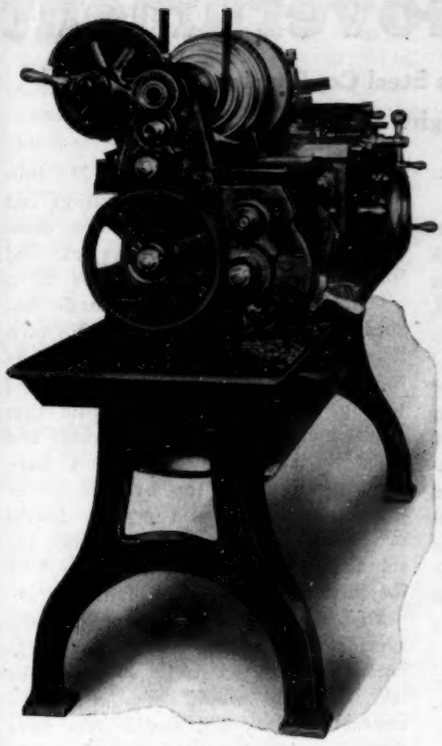


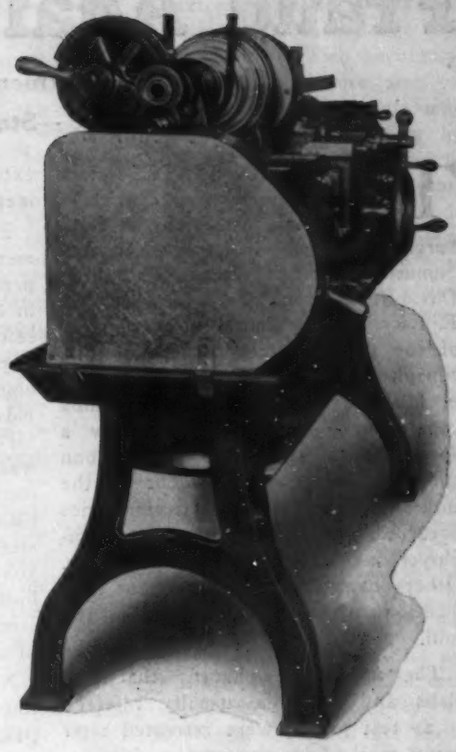
FIG. 1—VALVE OPERATING SIDE OF LARGE GAS ENGINE



Lathe Unguarded

Safety in the Shop

Five Illustrations That Tell Their Own Story



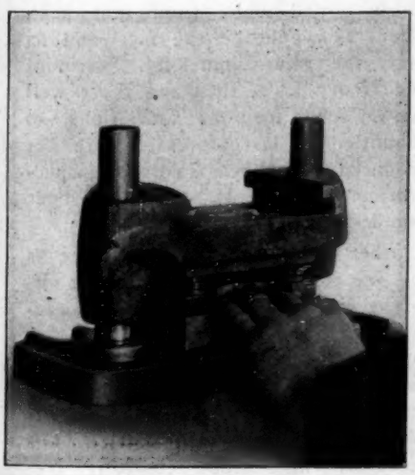
Lathe Guarded

THAT a manufacturing lathe may be guarded effectively without incurring any heavy expenditure is demonstrated by the two illustrations at the top of this page. The tool, a Hendy-Norton lathe, is in operation at the plant of the Burroughs Adding Machine Co., Detroit. The guard is built entirely of heavy sheet steel, cold-riveted, and is of such form that it could be easily made in any shop. The guard is not bolted or clamped in any way and may, therefore, be easily removed. It does not interfere with the operation of the draw-in bar when spring collets are used. It fits snugly to the oil pan of the lathe and does not easily work loose or chatter. It effectually prevents any injury through the fingers or clothing of the workman being caught in the change gears.

The illustration in the lower left-hand corner of the page shows a safety punch press die that is said to have saved many fingers. The upper half of the die is cut away, so that the workman's hand cannot be crushed when he inserts the piece. This device is particularly valuable when the press unexpectedly repeats and makes two strokes in succession instead of only one.

Throughout the plant of the Burroughs Adding Machine Co. tarpaulins are available for smothering incipient fires of all kinds. They are hung on clips that hold them securely, but permit their easy release. It is much better to have fire tarpaulins on the wall in plain sight in this way than to have them stowed away under a bench or in some other out-of-the-way place. The tarpaulins are heavy and are well stitched and hemmed on all four edges.

Accidents resulting from heavy electric currents are usually serious. To prevent dangerous shocks, the Burroughs Adding Machine Co. has placed a high, strong picket fence around its transformers and switch house. Warning signs are placed on the gate in the fence and on the door to the substation. In addition, the door and gate are always kept securely locked to prevent meddling.



Saving Fingers

To Stop a Fire

Preventing Electrocution

Fraud Against the Government

Charged in Indictments Returned Against Carbon Steel Co. Employes —Statement by President McKnight

THE UNITED STATES grand jury for the western district of Pennsylvania last Friday, at Pittsburgh, returned indictments against Samuel M. Wetmore, Dennis K. Bullens, David J. Simpson, Henry Lutz and Jas. E. Lacy, alleging that they, as employes of the Carbon Steel Co., Pittsburgh, conspired to defraud the government in filling a sub-contract for Panama canal work. Mr. Wetmore, now a special sales agent for the Carbon company, was superintendent of the mill when the alleged irregularities occurred, and Mr. Bullens was employed as a metallurgical engineer. Others named in the indictment held positions of minor importance in the mill.

The indictment charges that test slabs and forgings, usually referred to as test pieces, were retreated after being marked by government inspectors, to make them comply with necessary specifications. The indictment, which covers more than a score of typewritten pages, presents seven counts.

Charles McKnight, president of the Carbon Steel Co., has issued an official statement, bringing out points not mentioned in the grand jury's alleged findings. It will be recalled that the general contract for the erection of 46 mitering lock gates of two leaves each was awarded the McClintic-Marshall Construction Co., Pittsburgh, involving 60,000 tons. Part of the general contract was sub-let to the Wheeling Mold & Foundry Co., which also sub-let a portion of the contract, calling for nickel steel bearing plates, etc., to the Carbon Steel Co. This particular contract involved in the neighborhood of 800 tons.

After government inspectors reported alleged irregularity in connection with work performed by the Carbon company, George W. Wickersham, attorney general under the Taft administration, began an investigation in 1912. That inquiry apparently was dropped. Recently, however, E. Lowry Humes, district attorney for the western Pennsylvania district, re-opened the case before the federal grand jury. It generally was known, a week ago, that District Attorney Humes was conducting an investigation.

The alleged fraudulent scheme was put into operation Aug. 6, 1910, and extended to Dec. 1, 1912, the indictment says.

The fourth paragraph of the indictment reviews the nature of the work performed in connection with the building of lock gates for the canal, referring to Circular 576, issued by Capt. F. C. Boggs, of the corps of engineers. This circular asked for bids on the erection of "46 mitering lock gates of two leaves each", and was issued April 16, 1910, the indictment says. The circular included plans and specifications for "nickel steel pintles and wedges for fastening yokes; nickel steel bearing plates with bolts and nuts in hollow quoins; nickel steel pins for yokes and bearing plates in quoin and miter posts".

Nickel steel, the indictment continues, was specified only for the pintles, the pins for the yoke, the bearing plates on the quoin and miter posts and the wedges connecting the yokes to the anchorage castings. Pintles, pins and wedges "shall be hammered or forged down from ingots or blooms; the bearing plates shall be rolled sections, * * *" the indictment quotes the circular. Analysis of the material involved, to be annealed before machining, is given as follows by the grand jury findings: Not over 0.04 per cent of phosphorus nor 0.05 per cent of sulphur and not less than 3.25 per cent of nickel, and shall be subject to tensile and cold bending tests.

Men against whom indictments were found attempted to deceive Canal Commission inspectors stationed at the Carbon company's mill, it is alleged in the indictment. These men committed fraud, it is claimed, "(1) by surreptitiously, and without the knowledge or consent of said inspectors, taking test slabs which said inspectors would cut from such portions and slabs after the same were produced at the plant of said Carbon Steel Co. and stamped for identification with the official stamp of said inspectors, and before the same were tested by said inspectors, and wrongfully and deceitfully subjecting said test slabs to additional treatment which would cause said test slabs to comply with said specifications, and this in cases where the original forgings and slabs from which said test slabs would be cut * * * would not comply with said specifications in the matter of heats used in the manufacture thereof; (2) submitting to said inspectors forgings and slabs from heats which would comply with said specifications as and for sample forgings and slabs of a given heat, which would be under inspection by said inspector in such manner as to cause said inspectors to believe they were examining and testing forgings and slabs from that heat, when * * * such forgings and slabs so submitted would not have been produced at the heat so under inspection, and would not be lawful or proper samples thereof; and (3) submitting to said inspectors * * * forgings and slabs which had been annealed in the manner required by said specifications when * * * such forgings and slabs so to be submitted as last aforesaid would not have been annealed at all, but would only have been discolored by smoke in a way to give them the appearance of having been annealed.

"To effect the object of said conspiracy," the indictment continues, "Samuel M. Wetmore and Harry Lutz did, on Sept. 15, A. D. 1911, * * * surreptitiously and without the knowledge and consent of one John Beatty, who was then and there a duly appointed and authorized inspector of the said Isthmian Canal Commission, * * * submit to said Inspector John Beatty, forgings and slabs from heats which would comply with said specifications as and for sample forgings and slabs of a given heat which would be under inspection by said inspector, in such manner as to cause said inspector to believe he was examining and testing forgings and slabs from that heat, when, as would be the fact, and as they, the said Samuel M. Wetmore and Henry Lutz, then and there well knew, such forgings and slabs so submitted as last aforesaid were not produced at the heat so under inspection and were not lawful or proper samples thereof."

Other counts are much the same as the one reviewed above, but name different dates on which alleged fraudulent practice took place. Mr. Wetmore has been identified with the Carbon company for many years and is one of the best known operating officials in the Pittsburgh district. Officers of the Carbon company are: Charles McKnight, president; Dean

R. Wilson, treasurer; W. W. Noble, acting secretary; C. E. Middleton, general superintendent; C. F. Blue Jr., general sales agent, and S. M. Wetmore, special sales agent. The company owns a mill not far from the business center of the city, and manufactures billets, slabs, plates, locomotive axles, boiler and fire box steel, plain forged bars, tough turned bars, special carbon, chrome and nickel steel products and a number of specialties.

Chas. McKnight, president of the Carbon Steel Co., has made the following statement:

I was made president of the Carbon Steel Co. in October, 1911, but did not take active charge of the management of the mill until the summer of 1912.

"Some time in June, 1912, I think, my attention was called by one of our employes to the fact that one of the inspectors of the government claimed to have found some irregularities in preparing test plates for trial. I immediately took up the question with the inspector, but could get no actual proof of any wrong-doing. I followed the matter up until November, 1912, and while I could not get any evidence to indicate that there had been any wrong doing towards the government, I did find sufficient cause in connection with the company's own affairs to make me decide to change the heads of practically all our departments. This was done during December, 1912, and at the present time we have in our employ only two of the men who are mentioned in the indictment before the grand jury, and these are in minor positions.

"The Carbon Steel Co. had no direct contract with the Isthmian canal commission at any time, but was a subcontractor through the Wheeling Mold & Foundry Co., to which we sold steel to the amount of about $54,000. None of this steel was ever returned to us nor have we ever received any complaints from the Isthmian Canal Commission that the steel was not what it should be; it did, however, in the summer of 1912, after the accusation was made against our men, refuse to take any more steel on account of the contract.

"It has been our intention to aid the government in every way possible in this investigation, and in December, 1912, we laid before the government frankly all the information we had, copies of which are at present in the district attorney's hands.

"Since the change of our management, the Carbon Steel Co. has spent an amount exceeding $200,000 for new machinery and equipment; has changed the personnel of its management entirely and has had a number of contracts with the United States government which have been and which are being fulfilled satisfactorily to the government."

No Defective Steel Installed

Washington, May 26.—Alleged attempts to use defective bearing plates in the locks of the Panama canal, said Major F. C. Boggs, chief purchasing agent of the Isthmian canal commission, were discovered by government inspectors, and every piece of metal under suspicion was immediately retested throughout and replaced, if found to be below specifications. Statements had been made, following the federal indictments against employes and former employes of the Carbon Steel Co., at Pittsburgh, that defective work had been installed and still remains in the canal work.

Efficiency in Handling Scrap

Scientific methods for handling scrap materials will be the class of business to which William Jacobus, 38 Park Row, New York City, a corporation recently formed, with a cajital of $5,000, will devote its attention. The business is a branch of efficiency engineering, and under the Jacobus system, developed by Mr. Jacobus, the most advantageous methods of handling and segregating scrap metals and other waste materials are being installed. This system has been put in operation in all the navy yards of the United States, in the Chicago Railways Co., Chicago, and now is being completed in the Interborough Rapid Transit Co. and the New York Railways Co. system of New York.

Increase Capacity of Brass Foundry

Increased demand has necessitated the enlargement of the brass foundry operated by the Hydraulic Press Mfg. Co., Mount Gilead, O. This foundry now occupies a building 90 feet long and 30 feet wide. Three melting furnaces are installed. This company builds all its own valves and fittings for its extensive line of hydraulic presses and pumps as well as a great many valves for special purposes. In addition to this considerable contract brass casting work is also handled. Recently this company put a new erecting shop in operation. This building is 120 feet long, 80 feet wide, with an extreme height of 54 feet. The equipment includes a heavy electric traveling crane. Two accumulators, one for high pressure and one for low pressure, and an intensifier have been installed for testing hydraulic presses, pumps, valves and fittings before they leave the factory. The testing equipment also includes motor-driven high and low pressure pumps, which are controlled by automatic electric starters. This equipment has a maximum pressure capacity of 10,000 pounds per square inch.

Plans for Bridges

Cincinnati, May 26.—Plans and specifications for two bridges over the Little Miami river, near Cincinnati, have been agreed upon by commissioners from Hamilton and Clermont counties, Ohio. One of the bridges will be located at Miamiville and will cost about $83,000. The other will be at Remington, O., and will cost about $43,500. Both of these structures were destroyed by the floods in March, 1913, but the reconstruction has been delayed because no agreement could be reached between the commissioners from these two counties. Work will be pushed forward as rapidly as possible.

The Lexington & Eastern Railroad Co. has submitted plans for the construction of a railroad bridge over the North Fork of the Kentucky river, 2 miles above Hazard, Ky., to Colonel Henry Jervey, in charge of Cincinnati District No. 2, corps of engineers, for the approval of the war department.

Removes Offices

The American Metal Co., formerly at 52 Broadway, New York, has taken offices in the new Adams Express building, 61 Broadway, where it has leased the entire 28th floor. This will be the headquarters of its subsidiary companies, which include the Southern Aluminum Co., the Bartlesville Zinc Co., the Ohio & Colorado Smelting & Refining Co., the American Zinc Co., the Metallurgical Co. of America, the Balbach Smelting & Refining Co., the Lanyon-Starr Smelting Co., the Cia Minera de Tenoles and others.

After having manufactured bolts and screws here for 47 years, Reynolds & Co., New Haven, Conn., are planning to close their plant permanently this week. The general state of business is given as the reason for retirement.

Recent Coke Oven Developments

A Study of the Trend of the Times in the By-Product Coke Industry and Its Relation to the Steel Business

BY WILLIAM H BLAUVELT

IN 1913 THE TONNAGE of by-product coke amounted to 12,714,700 tons, or more than 27 per cent of the total coke produced in the country. This is an increase of about 1,600,000 tons over 1912, and it is probably not far from the truth to say that by the close of the current year the production will be at the rate of 14,000,000 tons per year. Compared with 1910, this means a growth of 100 per cent in four years.

From the United States geological survey reports it appears that the average value of the coke and by-products obtained per by-product oven in 1912 was $11,265, as compared with $1,019 as the average yield per bee-hive oven. The total value of the by-products recovered was over $16,000,000. If the by-products had been recovered from the coal used in making coke in bee-hive ovens, they would have been worth approximately $80,000,000—at the prices ruling in that year. The average yield of coke from by-product ovens was 75.3 per cent and in bee-hive ovens 64.7 per cent, a difference in favor of retort ovens of 10.6 points, or 16.4 per cent. If this yield had been obtained from the bee-hive ovens it would have added to the wealth of the country 5,390,000 tons of coke, if the same coals had been coked in by-product ovens, in addition to the above value of the by-products. This loss is equivalent to the absolute destruction of about 6,800,000 tons of our coal supply during the year. I have given these figures as suggestive of the importance of the by-product oven in the conservation of natural resources. In this connection it is interesting to note that recent work in some by-product ovens is showing conclusively that the high volatile coals of the Connellsville and Klondyke districts make by-product coke quite equal to the best coke that can be made in bee-hive ovens from the same coals.

FIG. 1—MAP SHOWING LOCATION OF BY PRODUCT COKE OVENS IN THE UNITED STATES

The map, Fig. 1, which is presented herewith, shows the distribution of the by-product coke plants in the United States. There are 42 of these plants. The map shows that in almost every case the by-product ovens are located at the point of consumption rather than at the coal mines, as distinguished from the almost universal practice with regard to bee-hive plants. In the five coke-producing states of the south, the percentage of by-product coke is much larger than in the country as a whole. With the completion of present construction nearly half of the coke made in the south will be by-product coke. This point is worthy of consideration in connection with the work the southern states are doing in the conservation of their resources.

One of the most notable improvements which has been made in the industry since its introduction into this country is the increase in output per oven unit and per man employed. When the first ovens were brought over from Europe they had a capacity of 4.4 tons of coal per day, and one crew of men was capable of handling about 25 ovens. This gave a capacity of 110 tons of coal per day with a unit crew. Today the most modern ovens have a capacity of 20 tons of coal per day, and improved organization and modern machinery permit practically the same crew to handle from 50 to 60 of these ovens, thereby coking from 1,000 to 1,200 tons, instead of the original 110 tons. I know of none of the other metallurgical industries which has shown a larger growth in tonnage efficiency in the same time. This is a conservation of labor well worth considering along with the conservation of our coal supply. Progress in this respect has been distinctly greater in America than in Europe.

Waste Heat Ovens

The by-product oven has been developed along two lines: the waste heat oven, and the oven recovering the maximum amount of surplus gas. The former is the simpler type. It is ordinarily installed in places where the gas has little value. As is well known, in the carbonization of coal in a retort oven a portion of the gas produced is used for heating the ovens while the remainder is available for

A paper presented at the spring meeting of the American Iron and Steel Institute at New York, May 22. The author, W. H. Blauvelt is consulting engineer for the Semet-Solvay Co., Syracuse, N. Y.

other uses. The waste heat oven is not designed to obtain the greatest possible quantity of surplus gas, and the products of combustion going off at a high temperature are utilized for raising steam. This practice is comparable with that employed in those bee-hive oven plants where the tunnel-head gases are collected and led under boilers, and to the non-regenerative heating furnace with boilers for utilizing the waste heat.

With the growing use of machinery for the storage and preparation of coal and for the preparation of coke, and the substitution of machinery for hand labor in other parts of the process, the requirements for power have grown materially, so that the amount of power required for a modern coke oven plant is very considerable. There are many cases where the most economic results are obtained by a plant so designed that there is just enough heat in the waste gases to supply the steam required for the operation of the plant, leaving the remainder of the gas available for sale.

A boiler plant properly designed for waste heat, with its accompanying economizers for preheating the feed water, is the most economical apparatus for utilizing heat in an industrial plant; that is, such a boiler plant will deliver the gases to the chimney, or to the exhaust fan which often replaces the chimney, at the lowest possible temperature consistent with commercial results. Such a design permits a very simple type of oven, with low first cost and low cost of operation. In the type of oven with which I am most familiar, the Semet-Solvay oven, these principles have been thoroughly developed, and under the conditions described above very satisfactory results have been obtained. A typical cross section of this oven is shown in Fig. 2.

The gases are burned in the combustion flues, and then passed to the sole flue beneath the oven and out through the chimney flue to the boiler plant. The air for combustion passes first under the sole flue and then through the narrow flues on each side, where it comes into intimate contact with the heated brickwork; thence upward to the heating flues, where it meets the gas. By a proper proportioning of these parts enough heat is abstracted by the air from the waste gases so that the highest temperatures may be produced in the combustion flues, and at the same time sufficient heat remains in the waste gases to produce all the steam required for the operation of the plant, without any expense for fuel or for labor in firing. This system requires no attention from the operators except the regulation of the air at the burners on the one hand, and the maintenance of proper water supply to the boilers on the other. This method of heating the air is called "recuperation" to distinguish it from the familiar form of regenerator common to most high temperature furnaces.

Fig. 3 shows an oven designed to operate with the smallest amount of fuel, and at the same time maintain, as far as possible, simplicity of construction and operation. In this design, regenerators are substituted for the recuperative system, one pair of regenerators for each oven, with the two chimney flues arranged between them. The whole construction of the oven and regenerator is located between the two vertical walls peculiar to this type of oven. These walls extend from the concrete foundation straight through to the top of the oven. The operation of the regenerators is, in general, similar to that of an open-hearth furnace, except that an entire block of 60 or more ovens is reversed at one operation. The air is usually blown in by a fan located beyond the reversing damper and is distributed under the block through a single chimney flue. It enters at the bottom of the regenerator, rises and passes through the flue system, meeting the gas at the several burners in the combustion flues. On reversal, the air enters the other regenerator, rises through the air flue, shown in dotted lines, and descends through the horizontal combustion flues, meeting the gas as before. The products of combustion pass out through the other regenerator to the reversing damper and stack in the usual manner. By this system the entire series of combustion flues are swept by all of the air required for combustion, so that hot spots are prevented and a uniform temperature is maintained throughout.

Problems in Oven Construction

Any one familiar with the use of the high temperatures required in metallurgical work will realize the difficulties connected with the proper heating of a by-product oven. The walls of the chamber are, say, 36 feet long and about 12 feet high. Every portion of both of these chamber walls must be heated to a high temperature, and the temperature must be uniform in all parts, excepting that perhaps the upper part may be somewhat cooler. Any inability to control the temperature at any portion of this surface, about 430 square feet, means the production of imperfect coke, delay in the operation, or injury to the brick work. The method used in controlling the heat over this surface is interesting. It is illustrated in Fig. 4. The air raised by the regenerators to a temperature of about 1,000 to 1,100 degrees Cent. travels through the flue system, as described above. At the ends of the flues are gas burners, consisting of simple pipes, which admit the gas. When the air is traveling downward through the system it flows through the first flue until it reaches the first gas burner. The

SEMET-SOLVAY COKE OVENS

PLANT		NO. OVENS
Semet-Solvay Co.	Syracuse, N.Y.	40
Semet-Solvay and Dunbar Furnace Co	Dunbar, Pa.	110
Semet-Solvay Co.	Ensley, Ala.	240
National Tube Co.	Benwood, W. Va.	120
Semet Solvay Co.	Detroit, Mich.	175
Philadelphia Suburban Gas and Electric Co.	Carster, Pa.	40
Central Iron and Coal Co.	Tuscaloosa, Ala.	60
Milwaukee Coke and Gas Co.	Milwaukee, Wis.	160
Pennsylvania Steel Co.	Lebanon, Pa	90
Empire Coke Co.	Geneva, N.Y.	46
Cleveland Furnace Co.	Cleveland, Ohio	100
By-Products Coke Corporation	So. Chicago, Ill.	280
Pennsylvania Steel Co.	Steelton, Pa.	120
North Shore Consolidated Gas Co.	Waukegan, Ill.	13
Kentucky Solvay Coke Co.	Ashland, Ky.	54
Indianapolis Gas Co.	Indianapolis, Ind.	41
	Total	1689

OTTO COKE OVENS

PLANT		NO. OVENS
New England Gas and Coke Co.	Everett, Mass.	100
Camden Coke Co.	Camden, N.J.	150
Hamilton Otto Coke Co.	Hamilton, Ohio	100
Pittsburg Gas and Coke Co.	Glassport, Pa.	120
Lackawanna Iron and Steel Co.	Lebanon, Pa	228
Cambria Steel Co.	Johnstown, Pa	372
Maryland Steel Co.	Sparrows Pt., Md.	100
Citizens Gas Co.	Indianapolis, Ind.	100
Michigan Alkali Co.	Wyandotte, Mich.	30
Zenith Furnace Co.	Duluth, Minn.	50
Lackawanna Steel Co	Buffalo, N.Y.	188
Carnegie Steel Co.	Farrell, Pa.	212
Dominion Iron and Steel Co.	Sydney, C.B.	320
Northwestern Iron Co.	Mayville, Wis.	40
	Total	2710

KOPPERS COKE OVENS

PLANT		NO. OVENS
Woodward Iron Co.	Woodward, Ala.	140
Tennessee Coal and Iron Co.	Fairfield, Ala.	280
Illinois Steel Co.	Joliet, Ill.	280
Indiana Steel Co.	Gary, Ind.	560
Coal Products Manufacturing Co.	Joliet, Ill.	35
Algoma Iron and Steel Co.	Sault St. Marie, Ont.	110
Minnesota Steel Co.	Duluth, Minn.	92
Maryland Steel Co.	Sparrows Pt., Md.	170
Inland Steel Co.	Indiana Harbor, Ind.	64
Republic Iron and Steel Co.	Youngstown, Ohio	60
	Total	1751

DIDIER COKE OVENS

PLANT		NO. OVENS
Lehigh Coke Co.	So. Bethlehem Pa.	300

ROTHBERG COKE OVENS

Patent No. 804,026

PLANT		NO. OVENS
Lackawanna Steel Co.	Buffalo N.Y.	281

KLÖNNE COKE OVENS

Patent No. 813,321

PLANT		NO. OVENS
Central Indiana Gas Co.	Muncie Ind.	22

THE GAS MACHINERY CO. COKE OVENS

Cleveland, Ohio

PLANT		NO. OVENS
Cambria Steel Co.	Johnstown Pa.	20

TOTAL NO. BY-PRODUCT COKE OVENS 6781

DISTRIBUTION OF COKE OVENS IN THE UNITED STATES

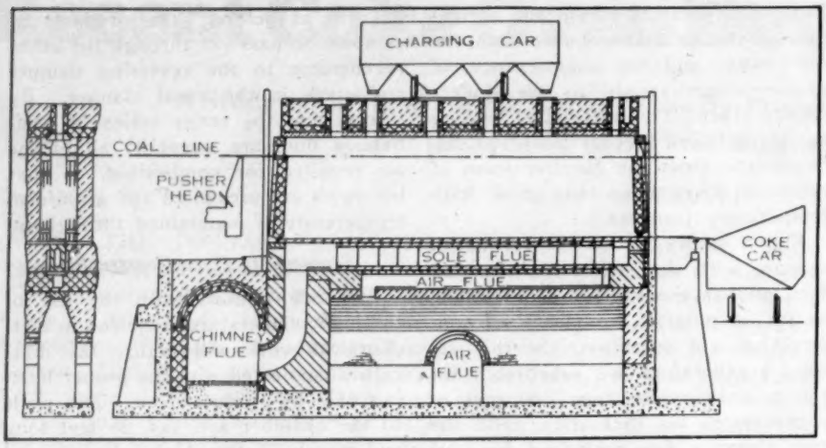


FIG. 2—CROSS SECTION OF A TYPICAL COKE OVEN

stream of gas is deflected downward by the air current and burns in the air as it travels through the flue. At the end of the second flue the air meets another stream of gas, which also is deflected downward and heats the third flue, and so on, until the gas from the last burner consumes the last of the oxygen.

When the air current is traveling upward the streams of gas are deflected upward, so that the entire combustion system is reversed at the usual half-hour periods by the manipulation of only one reversing damper for the entire block of ovens. A proper adjustment of the relative amount of gas delivered by each of the burner pipes maintains just the right relation between the heats in the different parts of the system, with the minimum attention. This method insures an even distribution of heat throughout the whole heating system. It seems clear also that in the practice of passing the entire volume of air required for the combustion through the entire flue system there is a gain in efficiency of transfer of heat from the hot gases to the oven walls, as compared with the older methods of heating.

There has been some discussion as to whether the heating of a by-product oven is effected by radiant heat or by convection and conduction, but I believe that the arguments are in favor of the latter theory. Under the conditions which exist in a coke oven the brick wall, at working temperatures, is a good conductor of heat. This is illustrated by the fact that an increase of the thickness of this wall from 2½ to 4½ inches does not demand in practice a higher temperature in the flues to produce the same result in the coking chamber. The flame as burned in the oven flues is only slightly luminous, and it has been shown by good authority that the radiation from a non-luminous flame is only about one-third of that from a luminous flame. Moreover, since radiant heat is transferred in accordance with the difference between the fourth powers of the temperatures of the radiant and receiving bodies, while heat is transferred by conduction proportionately to the first power of the difference in temperatures, it would seem clear that under the conditions we are considering, at least a large portion of the heat transferred from the hot gases to the flue walls must be by convection and conduction, and the system which uses this latter method is the more efficient.

In a system of heating flues where the layers of gases lying next to the walls are practically stationary, or moving slowly, it has been shown by experiment that these layers of quiet gases form an effective non-conductor which offers a greater obstacle to the transfer of heat than the wall itself. When the flow of gases is sufficiently rapid to sweep away these quiet layers the hot gases are permitted to come in direct contact with the walls and transfer their heat to the substance of the wall according to the first power of the difference in temperatures, and the efficiency of the transfer is proportionately good. The comparative rapidity of flow of the gases during their combustion also has the practical value of distributing the heat and preventing injury to the brickwork, avoiding thereby the dangerous condition which arises in an operation where temperatures are generated approaching the melting point of the refractory material.

Each burner on the Semet-Solvay oven is directly under the hand of the man in charge of the heats as he walks in front of the ovens, and each flue may be inspected by a glance, by the removal of a plug from a peephole. The importance of convenient access both to the control of the gas supply and to the inspection of the heating flues in a block of by-product ovens cannot be stated too strongly. With a given coal, the quality of the coke produced depends very much upon the maintenance of the proper temperature in the oven, not only as a whole, but in every part, since nothing injures the quality of the coke more than inequalities in the heat in different parts of the chamber, so that certain portions of the charge are over-coked while the cooler spots are being finished. In an industrial plant it is essential that any important operation shall be done conveniently and in comfort to the operator, otherwise one may be sure that it will be done badly except under the closest supervision. Given good construction and simplicity of parts, the oven which permits the most convenient and accurate control of the heats is the best oven.

Discussion by Carl A. Meissner

The figures given in Mr. Blauvelt's very interesting paper show in a striking manner to how great an extent our national coal resources, and

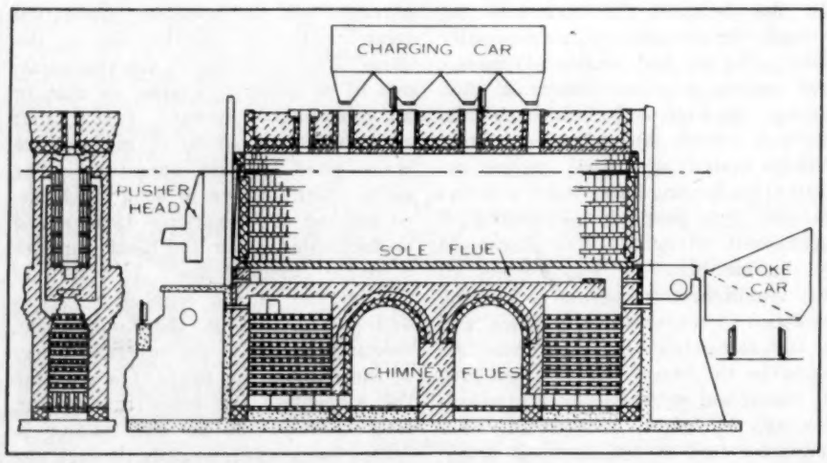


FIG. 3—MODERN SEMET-SOLVAY OVEN

the valuable by-products derived therefrom, could be conserved by the more extensive use of the by-product as against the bee-hive coke oven in the manufacture of coke. He also describes the development made by his company in the construction of by-product coke ovens in increasing their capacity and efficiency.

Mr. Blauvelt shows clearly how much has still to be done in this country in order to replace the bee-hive ovens by the by-product ovens. The main reason for this is claimed to be the high initial cost of constructing a by-product oven plant as against a bee-hive oven plant. I say "claimed to be," because when we consider all the costs—the conservation of the coal, larger coke yields, the recovery of the gas, tar, sulphate of ammonia, benzol, etc., in fact, all factors connected with the question of manufacturing coke from coal—it is not possible to present any figures that will not show a much larger return on the original investment from a by-product coke oven installation as against a bee-hive coke oven installation for coking the coal taken from a given area of coal lands. This is the ultimate crux of the whole situation from a manufacturer's standpoint.

The advantages of better coking control, more uniform quality of coke, ability to collect and mix at one plant various coals, to improve blast-furnace operations, also lessen the coke consumption and reduce the whole cost of making pig iron as well as improve its quality for making steel are all points that have to be taken into consideration.

Mr. Blauvelt refers to the gradual increase in capacity of ovens, which is governed largely by their dimensions and by the coking time. I am satisfied that we will be able to increase this capacity slightly with every new plant that we may build until the final limits, which will be governed by practice and experience, are reached. Great care must be exercised in doing this. I know of several cases where attempts were made to "jump" to greater dimensions with very unsatisfactory results.

As to the number of ovens to a battery and the number of batteries to a plant, this is again a matter for careful study and consideration. We have at Gary, Ind., 560 ovens and at Joliet, Ill., 280 ovens, and our experience has been that the operating cost per ton of coke at these two plants is practically the same. We feel that it would not be wise to place more than up to 100 ovens of American silica brick construction in a battery nor install more than 600 ovens in a plant unit. The operative supervision becomes more difficult unless additional department heads are employed, which means increased cost, and where coke has to be "made right" in order to give the best results in a blast furnace, this operative supervision is a factor of prime importance.

Coking High Volatile Coals

The most important question that has probably delayed more serious consideration of by-product coke oven installations and prevented greater progress in this direction, has been the one of whether high volatile coals can be coked in by-product ovens so as to give as good a blast-furnace coke as many of them do in bee-hive ovens. This refers particularly to the great Connellsville and Klondike coal regions, though it also affects many other districts having high volatile coals heretofore not considered fit for coking even in bee-hive ovens. Mr. Blauvelt refers to his successful experience with the use of high volatile coals and all of our experience in this direction shows that many of these high volatile coals can be coked to the extent of 100 per cent, so as to give a good blast-furnace coke, while in other cases suitable coke is made by the admixture of 10 to 35 per cent of low volatile coals. Even those coals which have been considered by many as not being at present available for coking purposes—such as certain sections of the Pittsburgh seam, and those of a great many other coal districts—have been and are being used to make a satisfactory blast-furnace coke by being mixed with larger quantities of low volatile coals, up to 60 and 80 per cent of the latter being used.

There can be no further question in my mind that the present types of by-product coke ovens have solved the problem of ultimately being able to utilize for coking purposes in a greater or less degree almost any bituminous coal found in this country. Even anthracite coals are mixed in small proportions with some of the high volatile coals in Germany and have been found to make a more satisfactory coke than some of these high volatile coals when coked at 100 per cent.

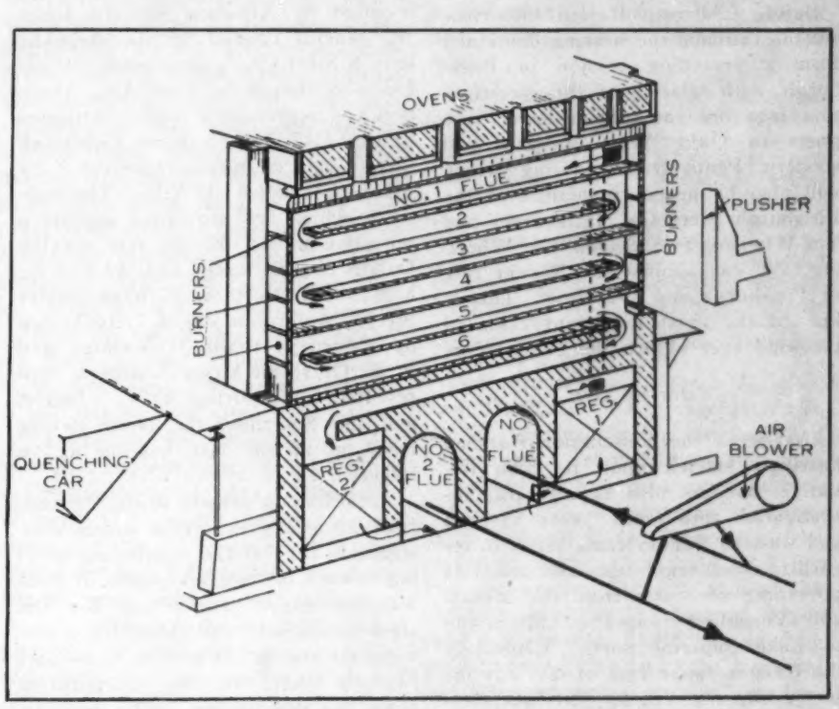


FIG. 4—DIAGRAM OF SEMET-SOLVAY FLUE CONSTRUCTION

In view of all the above, the point of keen interest is the type or system of by-product oven which is best suited for accomplishing this. Mr. Blauvelt very clearly points out what the requirements of the horizontal type of oven are for this purpose, and he shows that simplicity and perfection of uniform heating are the two main requisites.

The new Semet-Solvay horizontal flue regenerative oven described by him is one of the latest types of by-product oven constructed to meet the conditions in this country. It natur-

(*Continued on page 984b*)

Earnings of Ore Roads Discussed

In Hearings Before the Interstate Commerce Commission— Some Interesting Testimony

Washington, May 26.—The ore rate structure throughout the greater producing and consuming regions is gradually being brought nearer adjudication at the hands of the Interstate Commerce Commission. A question of unusual perplexity and contention, it has been placed before the commission in one form or another with unusual emphasis for the past three years, and many new angles and further situations have developed.

Before Chairman Harlan tomorrow will be resumed the hearing continued from a preceding session in Pittsburgh, with relation to the investigation into ore rates from lower lake ports to Ohio, West Virginia and western Pennsylvania, during which will also be heard complaints of the Pittsburgh Steel Co., Pittsburgh, and The Wheeling Steel & Iron Co., Wheeling, W. Va., against the 88-cent rate to Pittsburgh and Wheeling. This is one of the most important cases of the kind ever before the commission.

Rates on Ore

Last week the commission resumed hearings, started upon its own initiative, as was also the general investigation into Ohio, West Virginia and western Pennsylvania rates, in regard to rules, regulations and practices governing ore rates from the Mesabi and Vermilion ranges of Minnesota to Lake Superior ports. Ultimately the Cuyuna range rate of 60c was inserted into the record. The independent steel companies have intervened, protesting against the 60-cent rate and desiring a reduction, with the hope that it may be established at 40 cents per ton. In addition to these cases, there is pending before the commission for decision the complaints of the Hayes Mining Co., the Newport Mining Co., and Corrigan, McKinney & Co., against the 40-cent rate from the old ranges of Michigan and Wisconsin to Lake Michigan ports, and the complaint of the Ontario Iron Ore Co., Ontario, N. Y., against rates from its mines to Pennsylvania points. The complaint of independents against the 5-cent rate to the valley from lake ports is also awaiting decision. Each of these numerous cases has a bearing on the other.

Commissioner Meyer, who is conducting the hearing in the Mesabi-Vermilion-Cuyuna investigation, set Sept. 28 as the tentative date for resuming and concluding the evidence in that case. Three days were devoted to it last week and perhaps it will take that long, if not longer, to submit additional testimony.

The independent steel companies coming in as interveners include those of the Mahoning and Shenango valleys of Ohio and Pennsylvania, respectively, and the Cambria Steel Co., Johnstown, Pa., all of which are represented by Attorney Richard Jones Jr., general counsel of the Republic Iron & Steel Co., Youngstown, O.; the Jones & Laughlin Steel Co., Pittsburgh, represented by Attorney George C. Wilson, and the Pittsburgh Steel Co., Pittsburgh, represented by Attorney Challen B. Ellis. The railroads which are protesting against a reduction of the 60-cent rate are the Duluth & Iron Range and the Duluth, Missabe & Northern, United States Steel Corporation lines, represented by Attorneys Frank B. Kellogg and R. E. Olds; the Great Northern, represented by Attorney E. C. Lindley, and the Soo line, the latter having come in at the last hearing as an intervener.

According to present plans, the railroad attorneys expect to direct considerable time at the concluding hearing toward cross examination of Paul Mueller, expert accountant for the steel companies, who submitted a tremendous amount of data to show particularly that the two Corporation roads are making big profits on their ore traffic. The steel companies, through Mr. Mueller, are upholding the claim made in a monograph of the geological survey that taking into account low grade ore, the Mesabi and Vermilion ranges will not be exhausted for 300 years. The railroads have tried to make the point that exhaustion of ore will take place in 30 years, and after that period the carriers will be cut off of their principal source of revenue and will be of no value. Considerable stress by the independent steel companies was laid on the land holdings of the Corporation roads and revenues arising from acreage sales and sale of products of the land, as well as from carrying products other than ore. The land, obtained through federal grant, originally contained 600,000 acres, but now 500,000 acres remain. The burden of the carriers' evidence in relation to this feature was that the aggregate received from sales of land and products was $700,000, a revenue which had been greatly depleted by reason of taxes, cost of production, etc.

Rukard Hurd, secretary of the Minnesota tax commission, said that for the year beginning May 1, 1913, measured iron ore for taxation, in and on the Mesabi and Vermilion ranges totaled 1,413,693,060 tons, as compared with 1,409,511,200 tons for the preceding year, an increase for 1913 of approximately 4,000,000 tons of newly developed ore. The railroad attorneys tried to bring out the fact that increased tonnages from time to time were due to more scientific measurement rather than through drilling. It was Mr. Hurd's opinion that both were factors in the situation, but he made it plain that he thought the principal increase was due to the finding of newly developed ore. Mr. Hurd said he thought the apex of the ore output from those ranges had not been reached.

Auditor Martin's Testimony

At some length, George R. Martin, controller of the Great Northern, and auditor of its subsidiary, the Allouez Bay Dock Co., went into the relations of those companies. The railroad company gets 45 cents per ton out of the 60-cent rate, and the dock company the remaining 15 cents, he admitted to Attorney Jones. It was claimed that the handling of the ore at the dock costs the dock company 3 cents per gross ton, while 7 cents per ton represents the operation, capitalization, depreciation and other charges. There were 14,000,000 tons handled over the dock in 1912, it was stated, at a total cost of $1,010,893.50 and with gross receipts of $2,087,540.26.

It was declared by Mr. Mueller that per ton mile receipts of the two Corporation roads were greater than those of any other lines either in the eastern or western division. Figures were submitted to show that since 1891 the two ore lines of the Corporation have hauled 268,442,531 tons, the D. & I. R. carrying 122,136,502 and the D., M. & N. 146,306,029 tons. Resulting from this, he said, was a gross profit after paying operating expenses and taxes on all their business of every character of $125,138,158, the D. & I. R.'s share being $59,245,787, and the D., M. & N.'s share being

$65,892,371, the profit per net ton being given as 46.62 cents, the D. & I. R.'s 48.51 cents and the D., M. & N.'s 45.04 cents. On this basis of alleged over collection, according to Mr. Mueller, the reasonable average rate to independent shippers for 1902 to 1913, inclusive, should have been approximately 36 cents a ton. It was claimed the excess income collected from independent shippers by both roads aggregated $21,034,374.73, the D. & I. R.'s share being given as $12,615,018.59 and the D., M. & N.'s as $8,419,356.14.

Mr. Martin, recalled to the stand, basing his statement on a compilation from operations of the Great Northern for 1908-1912, said that, to derive a 7 per cent return on its property, the company would have to receive 61.10 cents a ton, or 1.10 cents more than it receives.

S. C. Johnson, auditor of the D. & I. R., basing his figures on the book cost, said during its 30 years of existence that road had earned a surplus of $19,000,000 over and above what would be 10 per cent. It was stated that if the rate had been 60 cents throughout the 30 years—it was cut to that rate voluntarily three years ago from 80 cents—the result of operation would have been a deficit of $5,000,000 needed to make up 10 per cent on the capital. M. A. Kempton, auditor for the D., M. & N., said that during 21 years that road earned a surplus of about $30,000,000, and had the rate been 60 cents all that time, the earnings would have been $5,000,000. A large part of these earnings was put back into the road, as was done also in the case of the D. & I. R., it was stated.

The claim was made that Mr. Mueller based very little of his testimony on the 60 cent rate and that in figuring alleged profits he based his construction upon the nominal capitalization of the two Corporation roads, instead of their actual value. The D. & I. R. is capitalized at only $3,000,000, it was asserted, whereas it is actually valued at about $30,000,000. The D., M. & N., it was added, is nominally capitalized at $4,500,000, but is valued at about $34,000,000.

For Foreign Trade.—A convenient reference book for the exporter or the manufacturer who is interested in foreign trade, is a Bulletin of Imports and Exports of Merchandise into and from the United States by Countries and Principal Articles, which has just been published by the bureau of foreign and domestic commerce, and is sold by the superintendent of documents, government printing office, Washington, for 15 cents a copy. A glance at this pamphlet affords the business man a bird's-eye view of the character and volume of our commerce with any foreign country, as it gives the quantity and value of its principal purchases from us and its sale to the United States for the years 1912 and 1913.

On the Lakes

Campaign for Safety and Sanitation is Being Conducted

On the great lakes, the Lake Carriers' Association has conducted a systematic campaign for the elimination of the avoidable accident by distinctly marking dangerous places and by appointing safety committees from among the crew on each ship. In addition, the association has this spring begun a campaign on sanitation to promote the physical well-being of the men. A man is obviously not competent to do a day's work unless he is in good health. The initial steps in the campaign have to do with the care and preparation of food supplies. Every dealer on the whole chain of lakes supplying meats, milk, groceries and ice to the boats has received a circular from the welfare plan committee of the Lake Carriers' Association outlining certain simple rules to be observed in the care of food stuffs. Meats are to be kept in the refrigerator away from flies and not exposed to handling by prospective customers. Milk must be pure and cannot be transferred from one can to another until the cans have been thoroughly sterilized and ice must under no circumstances come in contact with food. Manufactured ice is preferred because being made from distilled water it is chemically pure, while natural ice may be of doubtful purity.

In addition, the sanitary committee of the Lake Carriers' Association has defined the areas on the great lakes from which drinking water may be drawn for the vessels. It is known that practically all the water in the connecting rivers and for a distance from 8 to 12 miles from the shore line of the larger cities is polluted.

The Ely Norris Safe Co., manufacturer of manganese steel safes, has closed its plant at Perth Amboy, N. J., and removed to its new location in Philadelphia. The change was made in order that the company might be nearer the source of the castings which it uses. Most of the old employes will move to Philadelphia and remain in the employ of the company.

Shows Gain

Annual Report of Westinghouse Co. Reveals Large Sales

The report of the Westinghouse Electric & Mfg. Co. for the year ended March 31, 1914, shows gross sales of $43,733,646, a gain of nearly four millions over the preceding year, making it the heaviest year on record so far as sales are concerned. In 1911 the earnings on common exceeded those of last year, but at that the 1914 year showed a balance for common of 10.73 per cent compared with 8.2 per cent in the 1913 year. With the slump in business experienced in the last few months value of unfilled orders declined from $12,061,473 on March 31, 1913, to $7,951,385 on March 31, 1914. This was accompanied by a reduction in the working forces. The income account compares as follows:

Gross earnings	$43,733,646	$39,977,565
Cost of sales	39,016,424	35,406,293
Net mfg. profit	$4,717,222	$4,571,272
Other income	1,280,856	996,564
Gross income	$5,998,078	$5,567,836
Less adjust., etc	233,264	791,388
Net apcble to int	$5,764,814	$4,776,448
Int. charges	1,706,005	1,612,416
Net. avail. divs	$4,058,809	$3,164,032

The surplus as of March 31, 1913, was $7,348,522. This was increased by the net income for the year and various items detailed in the statement of profit and loss to a gross surplus of $12,002,304. By charges for dividends declared during the year on the preferred stock at the rate of 7 per cent per annum, $279,909, and on the common stock at the rate of 4 per cent per annum, $1,405,989, and by miscellaneous charges aggregating $370,686, the gross surplus was reduced to $9,945,719. Depreciation and adjustments of investments were charged against this balance, totaling $2,286,589, leaving a surplus as of March 31, 1914, as shown by the balance sheet, of $7,659,130.

The Barnes & Kobert Mfg. Co., New Haven, Conn., shortly will move to Southington, Conn., to occupy the Milldale plant formerly occupied by the Clark Brothers Bolt Co. The latter concern is planning to make extensive additions to its new plant in Southington.

The Merrow Machine Co., Hartford, Conn., has let a contract for the erection of a three-story addition, 50 x 50 feet. The capacity thus will be increased by about 25 per cent.

TIPS FOR NEW BUSINESS

Equipment needs of the Iron and Steel works, Machine shops, Foundries and other Metal Working plants

In New York, demand for machinery continues very quiet and sales almost entirely are restricted to one and two tools at a time. Feeling continues good, however, and the outlook favors an increase in the volume of business in the near future. No new business has come out from the railroads in this territory, but a good many inquiries are expected to be put out by these interests in the near future. Export demand for machinery is rather dull. The second-hand machinery market is quiet.

In the Chicago market, nothing has appeared to change conditions and the same quiet that has prevailed for several weeks still rules. Almost nothing greater than sales of single tools is being taken.

In Pittsburgh, the more hopeful attitude of iron and steel mill managers, has given encouragement to machine tool builders and dealers. There has been no marked change in the machine tool situation, but it is apparent that the undertone of the market is slightly better than a few weeks ago. Inquiries have come out in somewhat better volume the last few days, but actual sales are no heavier. Builders of heavy rolling mill equipment, although not taking many new orders, are operating plants at capacity, in many instances.

In Cincinnati, the machine tool business continues to drift along without any indication of an improvement in sight. A little encouragement is felt over the recent report of heavy crops throughout the middle west, but railroads do not appear to be making any preparation to move them and have been doing very little buying since the first of the year. Automobile manufacturers have also been a disappointment and have closed for a very limited number of tools during the past six months. Foundries are running at about 40 per cent of their capacities and very few machine shops are running over 50 per cent of total capacities. Second-hand machinery is slow, but is in a little better demand than new machinery. The principal call is for lathes, milling machines, metal-bending and wood-working machinery.

EASTERN STATES

STRATFORD, CONN. — The Bridgeport Process Co. has been incorporated here; metal worker; $50,000; by Sanford Stoddard, Ewen McAchlin and William J. Bartley, all of Bridgeport.

PAWTUCKET, R. I. — Plans are being drawn for a 30 x 35 x 90-foot brick and steel power house for the Philips Insulated Wire Co.; two turbines and eight 300-horse-power boilers will be installed.

ARKPORT, N. Y.—Bids will be taken until June 4 by village trustees for a water works system; Chas. C. Hopkins, engineer, 349 Cutler building, Rochester.

ERIE, PA.—Erie & Pittsburgh railroad is having plans drawn for a large structural steel and concrete freight warehouse to be built at the Erie terminal before the end of the summer; estimated cost, $60,000.

NEW CASTLE, PA.—Engineer T. A. Gilkey is taking preliminary measurements for an 826-foot bridge to connect Hazel Dell and Ellwood City, which will cost about $130,000.

NEW CASTLE, PA.—The Harmony railway has been granted a 25-year franchise to supply this city with electric light; one of the conditions is that work be started within three months.

PHILADELPHIA.—Work on the concrete machine shop to be erected at Christian street and Schuykill avenue for the Philadelphia Electric Co. has begun; estimated cost, $10,000.

PITTSBURGH. — The Impervious Sheet Steel Co., which is building a new plant at Rochester, Pa., expects to complete work the next few weeks. Charles E. Pope is president of the company.

PITTSBURGH.—The Pittsburgh Expanded Metal Co., New Kensington, Pa., has been incorporated by Elmer E. Patton, J. C. Stewart, of New Kensington and E. T. Connor, of Arnold, Pa. The company is capitalized at $5,000.

PITTSBURGH. — The Cyclops Foundry Co., Union National Bank building, hopes to complete its new plant at Monongahela, Pa., in time to fill orders for second half delivery. The company lost its foundry buildings by fire early this year and is now erecting a plant which will be provided with modern equipment throughout.

JERSEY CITY, N. J.—The Maresca Safe Co. has been incorporated to deal in safes; $20,000; by Harry Maresca, Charles McCoy and Louis Scheid, all of Jersey City.

WASHINGTON.—Bids on material for the Panama Canal will be received until June 3 by F. C. Boggs for steel derricks complete with operating hoists, electroliers, wrought iron and steel pipe, copper hose, etc.

CENTRAL STATES

CANTON, O.—The Selas Co., of New York, manufacturer of a patented gas and air mixer on lighting and heating apparatus, is establishing a plant here.

CANTON, O.—The Canton Electric Co. has been granted permission to erect a 1-story brick and concrete transformer building to cost $4,000; this is made necessary by increased business.

CANTON, O.—The Union Metal Mfg. Co. is arranging to build a 70 x 250-foot factory building, it will be two stories high for 100 feet and the remaining 150 feet will be only one story high; this addition will double the plant's output; work to begin within 60 days.

CINCINNATI.—The Acme Machine Tool Co. is planning to increase its manufacturing facilities. Details have not yet been decided upon.

CINCINNATI.—The Cincinnati Fly Screen Co., which is a part of the Cincinnati Mfg. Co., will add a four-story addition to its plant on Evans street this city. The new portion will be 55 x 100 feet and of concrete construction.

CINCINNATI. — The George Streitman Sons Co. will build an addition to its plant at the southeast corner of Twelfth and Plum streets. The new portion will be 26 x 90 feet and will be concrete construction throughout. The only steel required will be for reinforcing purposes.

CINCINNATI. — The concrete work for the construction of an addition to the plant of the United States Can Co., Norwood, a suburb of Cincinnati, has been awarded to the L. Eid Concrete Steel Co., of that city. Bert Baldwin, of Cincinnati, is the engineer in charge of this work.

CINCINNATI.—The Ferro Concrete Construction Co. has been awarded the general contract for the new plant of the Home Steam Avondale Laundry Co., to be built on Reading Road near Florence avenue, this city. Several hundred tons of concrete reinforcing bars will be needed for this work.

CINCINNATI.—The Ferro Concrete Construction Co. has been awarded the general contract for the addition to the Methodist Book Concern, this city, through Samuel Hannaford & Sons, architects. The building will be six stories in height and of concrete construction throughout. The reinforcing steel will amount to from 300 to 500 tons.

CLEVELAND. — Cleveland Machine Knife Co. has increased its capital stock from $25,000 to $60,000.

DAYTON, O.—The Air Friction Carburetor Co. may erect a large manufacturing building; John W. Raymond, president and general manager says that increased business may force extensions.

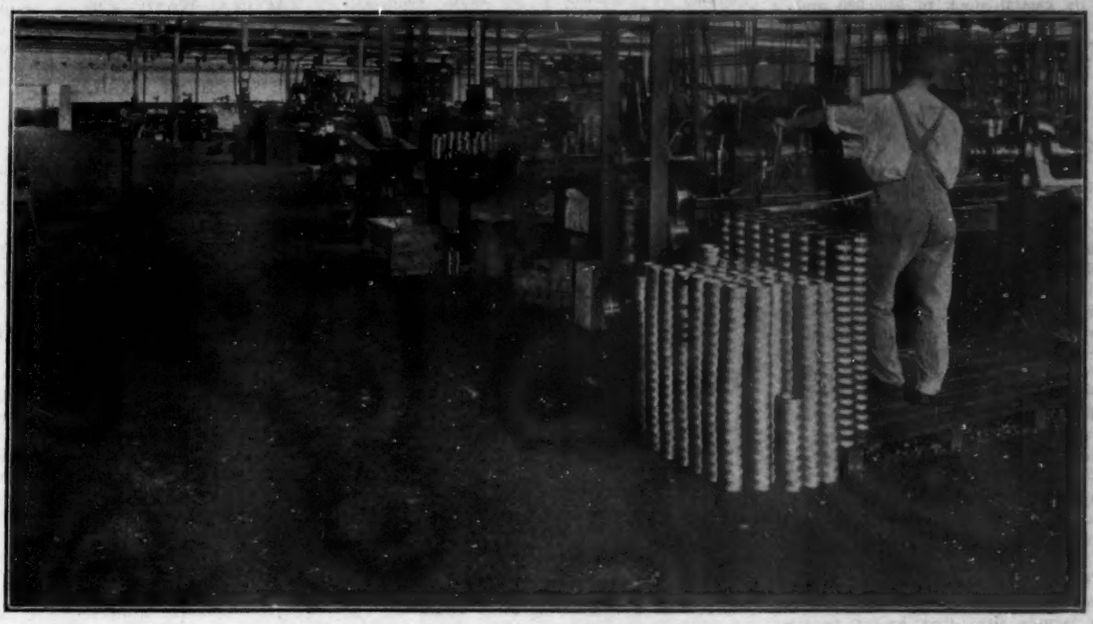
FREMONT, O.—The Lake Shore Electric railway has begun double tracking its line through this city; estimates cost, $70,000; steel ties on concrete bases and 100 pound steel rails will be used.

FOSTORIA, O. — The Allen Motor Co. plans to purchase the property of the Atlas Mfg. Co., located on the opposite side of the street, provided city officials will permit the erection of an overhead trestle; it is understood that the company will erect a 4-story, 130 x 270-foot brick building.

GLENDALE, O.—Bids will be received

Kreolite Floors

A Fitting Foundation For Shop Efficiency



Kreolite Block Floor in plant of The Hess-Bright Mfg. Co., Philadelphia, Pa., manufacturers of roller bearings. Building designed by Day & Zimmermann Company, Engineers, Philadelphia, Pa.

The manufacturing experience of The Hess-Bright Mfg. Co., coupled with the practical engineering experience of the Day & Zimmermann Co., resulted in the installation of the Kreolite Block Floor shown above.

THE DURABILITY of Kreolite Blocks, and their marvelous resistance to the hardest sort of wear, makes their installation a source of real economy for industrial plants of every nature.

AS THEY offer a very low tractive resistance, Kreolite Blocks are extremely easy to truck over, which is a very important factor in the reduction of labor costs.

THESE FLOORS have a pleasant and resilient "feel" under the feet of the workmen, yet they are firm and solid, giving perfect foundations—by our own system—for the installation of machinery at any and all speeds.

THIS IS the satisfactory showing that Kreolite Floors make wherever they are installed. They will solve your flooring troubles and cut down your overhead charges as well.

May we help solve your factory floor problem? Our Engineering Department is at your service. Write today for plans and estimate.

The Jennison-Wright Company

309 Huron Street **TOLEDO, OHIO**

until June 8 by board of trustees for extending the height of the standpipe 30 feet; Stegner, Hughes & Alves, Commercial building, Cincinnati, engineers.

HAMILTON, O.—Director of public service, Joseph W. Myers, will ask city council for authority to install a 1,000-kilowatt generator and a battery of two boilers to provide for 2 per cent overload; estimated cost, $60,000.

LOGAN, O.—The Logan Pottery Co. has increased its capital stock to $100,000 and it is understood that the extra money will be used in extending improvements.

MASSILLON, O.—The Massillon Aluminum Co. is erecting a plant here in Canal street which requires a total of 200,000 feet of lumber.

MASSILLON, O.—The Massillon Electric & Gas Co., subsidiary of the Dougherty syndicate of New York, expects to build its present plant at South Erie street; W. G. Williams, New York, construction engineer, has made drawings of the proposed improvements. B. A. Brooks is manager.

SILICIA, O.—This city is to have the Silicia Milling Co., a $300,000 industry backed by eastern capital. The proposed building will be 66 feet high, 100 x 200 feet, of concrete and steel structure; the company expects to start operating by Oct. 1.

WARREN, O.—The Standard Motor Co. plans to erect a $15,000 building here; increased business makes extension necessary.

YOUNGSTOWN, O. — The Standard Oil expects to start work immediately on a warehouse, wagon sheds, stable and office building in Poland avenue; the main building will cost $20,000.

GRAFTON, W. VA.—O. E. Heffner and partner are building a modern foundry on the old pump factory site; they expect to start operating by early fall.

HUNTINGTON, W. VA. — The Baggs Mfg. Co., Huntington, W. Va., has been incorporated with a capital stock of $200,000, to manufacture mine cars. Among the incorporators are Andrew J. Baggs, of Barnesville, O., Frank M. Baggs, of Portsmouth, O., and J. J. Roby, of Cleveland, O.

LOUISVILLE, KY. — The Samson Engineering Co. has been incorporated with a capital stock of $35,000 by B. M. McGraw, D. A. Caldwell and W. N. Wrights.

LOUISVILLE, KY.—Engineers of the Illinois Central railroad have asked Major H. C. Oakes, government engineer, for permission to replace the old swing bridge at Blackford, Ky., with a permanent heavier structure of steel. The petition will be recommended to the department of war.

INDIANAPOLIS.—The Nordyke & Marmon Co., manufacturer of mill machinery and autos, has bought a 21-acre tract on Nordyke avenue to accommodate extensions believed to be necessary in the near future.

INDIANAPOLIS.—E. H. Darrach, secretary of the Interstate Car Co., Paul White, a consulting engineer, and Frank M. Fauvre, a capitalist, have organized the Power Car Co. here with $15,000 capital stock; as yet the company is just experimenting with a motor truck which it expects to make after plans have been perfected.

INDIANAPOLIS. — The Hercules Forging Co. has been incorporated to manufacture forgings, dies, etc.; $25,000; by Alexander R. Holliday, secretary-treasurer of the National Concrete Co.; John H. Holliday, president of the Union Trust Co.; Anton Vonnegut, president and treasurer of the Vonnegut Machinery Co.; Owen M. Mothershead, manager of the Premier Sales Co. and Ward H. Dean, of the Hoosier Supply Co.

DANVILLE, ILL.—The Danville Malleable Iron Co., according to plans, will be enlarged to four times its present size; three new units will be added.

MOLINE, ILL.—The Moline Foundry Co. has increased its capital stock from $15,000 to $17,000.

QUINCY, ILL.—The Adams County Mississippi River Power Distributing Co. has been incorporated; $60,000; by John M. Schoeneman, Edgar G. Hedrick and Randall B. Echols.

DETROIT.—Plans have been mapped out for the complete reconstruction in Michigan and Ohio of the Detroit, Toledo & Ironton railroad by President J. M. Kern; work will include new roundhouses, shops and locomotives as well as bridges and tracks.

MARQUETTE, MICH.—Work has begun on the Jones furnace; a trestle 200 feet long and 25 feet wide is being erected to connect the furnace with the South shore tracks.

GALENA, WIS.—Galena Iron Works Corporation has been incorporated; $60,000; by T. M. Priestley, Edith Marcussen and W. V. Parkinson; T. M. Priestley, Mineral Point, Wis., attorney.

LA CROSSE, WIS.—Plans to organize a $500,000 aluminum ware manufacturing plant here were discussed by W. F. Hurtgen, chairman of the manufacturers committee of the board of trade, and President E. M. Wing, of the Industrial Association.

WAUSAU, WIS.—The Marathon Electric Mfg. Co. has been incorporated; $25,000; by J. S. Alexander, D. C. Everest, E. M. Bischoff and Neal Brown; the latter is also attorney.

SOUTHERN STATES

EMPORIA, VA.—Bids will be received until June 10 by water commissioners for furnishing and erecting a 200,000-gallon steel tower and tank.

ATLANTA, GA.—The Ford Motor Co. is beginning work on its proposed assembling plant here; estimated cost, $300,000.

ROME, GA.—J. G. Pollock, chairman of the board of roads and revenue of Floyd county, will open bids June 1 for a 60-foot highway bridge of steel or concrete over Silver creek according to plans of Keiffer Lindsay, county engineer, Rome.

OSKALOOSA, LA.—The Oskaloosa Ice & Cold Storage Co. has plans for rebuilding its entire plant and installing a new system; it will take about five months to make this change; the present plant has a capacity of 40 tons of ice daily.

MILFORD, TEX.—City will vote on water works bonds June 8; $14,000 will be spent for a 100,000-gallon plant with 60,000-gallon steel tank on a tower; Henry E. Elrod, Dallas, Tex., engineer.

MEMPHIS, TENN.—A new cotton seed warehouse equipped with modern machinery will be erected here by the Southern Cotton Oil Co., of New York. The building will be of concrete.

SAPULPA, OKLA.—Oil City Motor & Machine Co. has been incorporated; $2,000; by C. W. Toliver, R. V. Rule and C. W. Welsh, Sapulpa.

WESTERN STATES

PLENTYWOOD, MONT.—This place has voted $32,000 bonds to be used for installing water works and sewer system.

GOLDENDALE, WASH. — The Klickitat Northern railroad has been incorporated to construct a railroad to tap heavy timber between Lyle and Goldendale; $100,000; by F. A. Bannett et al.

NORTH YAKIMA, WASH.—The Central Heating Co. has asked the city for a franchise to engage in electric light and power business in addition to heating. The company proposes to build a $100,000 plant.

REPUBLIC, WASH.—F. M. Shields and Mahlon McCain, of Spokane, have applied to the county commissioners here for a franchise for a 35-mile electric transmission line between this place and Danville.

SEATTLE, WASH.—The Chappel-Perkins Belting Co. will build a reinforced concrete factory at 4763 Ballard avenue. Temporary quarters are at 4775 Ballard avenue.

SPOKANE, WASH.—Contract for the O. W. R. & N. steel bridge over the falls at this place has been awarded to Robert Wakefield, of Portland at $400,000; it will be 780 feet long with concrete piers.

TACOMA, WASH.—City is asking for 2,400 feet of 8-inch cast iron pipe and 9,037 feet of 6-inch cast iron pipe for use in the Local Improvement District 5017.

WENATCHES, WASH. — Land on both sides of the Columbia river near here has been purchased by the Chicago, Milwaukee & St. Paul railway; a large dam will be erected across the river about 15 miles below Beverly where it is reported that a power plant will be built for use in electrifying the companys' lines in this section.

CANADA

PRINCE RUPERT, B. C.—An estimate has been submitted to the council for a hydro-electric power plant at $248,845. Of this amount, $86,000 is for steel pipe and $22,320 for machinery.

TORONTO, ONT.—Bids will be received until June 16 for 24,000,000-gallon centrifugal pumps and engines; H. C. Hocken, mayor.

TORONTO, ONT.—Universal Tool Steel Co., Ltd., has been incorporated; $10,000; by G. Reul, R. H. M. Temple, A. J. Reid, W. L. Pinkey and F. C. Allen, all of Toronto.

TRADE NOTES

CHICAGO.—The Gun-crete Co. has opened its new offices in the McCormick building. This firm specializes in cement-gun work for engineering, industrial and mining structures.

CLEVELAND. — Orders recently booked by the Bruce-Macbeth Co. for its vertical, multi-cylinder gas engine, include: One 40-horsepower, two-cylinder natural gas engine for Pietro Elardo, Fredonis, N. Y.; one 60-horsepower, two-cylinder, natural gas engine for the Fairmont Gas Co., Underwood, W. Va.; one 150-horsepower, four-cylinder, natural gas engine for the Willard Storage Battery Co., Cleveland, making the seventh engine for this company; one 90-horsepower, four-cylinder, natural gas engine for Ohio University, Athens, O.; one 70-horsepower, two-cylinder, natural gas engine for the Wood & Spencer Engineering Co., Cleveland; two 50-horsepower, two-cylinder, producer gas engines for Alberta Financial Brokers, Ltd., Colgay, Alberta, Can.; two 60-horsepower, two-cylinder, producer gas engines for the village of Warroad, Minn.; one 150-horsepower, natural gas engine for the village of Caldwell, O.; one 70-horsepower, two-cylinder, natural gas engine for the city of Whitesboro, Tex.

MILWAUKEE, WIS.—The Crucible Steel Co. will install one 500-kilovolt-ampere and three 10-kilovolt-ampere transformers which will be furnished by the General Electric Co.

NEW ROCHELLE, N. Y.—The New Rochelle Foundry Co. which recently was incorporated with a capital of $15,000, advises that it will engage in a general castings business and also will manufacture some specialties. Plans for the construction of buildings and in general for the carrying out of the company's purposes, have not yet been determined. Frank J. Holler, 122 Fifth avenue, New Rochelle, is interested in the new company.

NEW YORK CITY. — Westinghouse, Church Kerr & Co., engineers, 37 Wall street, announce that they recently have undertaken the following work: Construction of eight shops and office buildings along the

south side of Johnson avenue, Jersey City, N. J., for the Central Railroad, of New Jersey, all buildings to be of structural steel with tile curtain walls; revamping of the Pearl street sub-station of the Hartford Electric Light Co., Hartford, Conn., installing a new layout for all alternating current switching; installation of outdoor sub-station and regulator equipment for the same company in the Unionville Electric Lighting Co.'s old plant; construction of a gas producer plant and coal handling apparatus at the Port Allegheny, Pa., plant of the Mississippi Glass Co.; miscellaneous construction work consisting of repairs and betterments to steam plant, shoring of building, etc., at Peter Cooper glue factory, Brooklyn, N. Y.; installation of pipe trenches and tunnels and increasing capacity of coal handling plant at Winchester Repeating Arms Co., New Haven, Conn.

PITTSBURGH. — The Aluminum Co. of America, will place in operation in its new plant at Massena, N. Y., 18 2,500-kilowatt rotary converters and nine 5,000-kilowatt water cooled transformers. All this apparatus will be built and installed by the General Electric Co.

SAN FRANCISCO. — The Cyclops Iron Works has ordered two 15-horsepower, four 30-horsepower and four 37-horsepower induction motors from the General Electric Co.

SOUTHBRIDGE, MASS. — So far as known, but three New England concerns will exhibit at the Panama Exposition next year—the American Optical Co., of this town, the Hallet & Davis Piano Co. and the Waltham Watch Co. The Optical company intends having one of the finest exhibits at the exposition.

WATERBURY, CONN. — The failure of the New England Watch Co. is responsible for the bankruptcy of the Waterbury Enamel Co. which manufactures watch and clock dials. A voluntary petition in bankruptcy follows pressure on the part of a bank for payment of a $5,400 loan. The New England Watch Co. owed the Enamel company $7,900. Herbert J. Phillips is president of the Enamel company.

WILMINGTON, DEL. — Receivers have been appointed for the Montross Metal Caskets Co., which has a factory at Hagerstown, Md. The company has a capital stock of $3,000,000 and gives its assets as $440,846, and liabilities at about $40,000.

WORCESTER, MASS.—Some of the departments of the Morgan Spring Co. ran throughout the winter on a 24-hour basis and are likely to continue on this basis during the summer. The company recently received an order from Sears, Roebuck Co., Chicago, for 1,500,000 buttonhooks—the largest single order it ever received.

YOUNGSTOWN, O.—The Reinforced Tile Roof Co. has lately been awarded the contracts for Panel-tile unit concrete roofs for the following buildings: Standard Oil Co., warehouse, Toledo.; Willys-Overland Co., blacksmith shop, Toledo; City Water Works, pumping station, Youngstown; Duncan building, Cleveland; Urschell Bates Valve Bag Co., factory building, Toledo; John Leavitt Theater, Market street, Youngstown; L. L. Banks Theater, Pittsburgh; Rowland & Clark Theater, Pittsburgh.

NEW CATALOGS

GRAB BUCKETS.—A profusely illustrated 8-page bulletin has recently been issued by the Hayward Co., 50 Church street, New York, which describes many interesting applications of Hayward grab buckets to excavating operations. Photographs show the buckets in use in all parts of the world.

ELECTRIC DRILLS.—A four-page folder issued by the Independent Pneumatic Tool Co., Chicago, is devoted to its extensive line of electric drills adapted for foundry and machine shop service.

SPRING MAKING MACHINERY. — A series of bulletins recently issued by Sleeper & Hartley, Worcester, Mass., describes and illustrates a line spring making machinery which is manufactured by this concern. The bulletins cover plain and universal spring coilers, spring upsetting machines, helical cutting and hooking machines, torsion spring machines, automatic tube straightening machines, etc. Each bulletin consists of four pages and includes illustrations, descriptive matter and specifications.

WOODWORKING MACHINES.—The Crescent Machine Co., Leetonia, O., illustrates and describes its extensive line of woodworking machinery in a 144-page catalog recently issued. A tool built by this company and described at length in this catalog is a universal woodworker, which consists of a band saw, jointer, saw table, borer and shaper. The machine may be purchased without band saw and shaper and other attachments may be added, adapting the machine for mortising, making mouldings, grinding tools, sanding, etc. This machine is intended particularly for users of woodworking machines who feel that they cannot afford a complete outfit of individual machines for the various operations performed by the universal tool. A varied line of pattern shop machinery is shown and the catalog in every respect is unusually complete.

Scrap Classification

Of the Republic Iron & Steel Co.

Iron Axles.—Iron railroad car axles, M. C. B. sizes, free from locomotive axles or defective or imperfect forgings.

Steel Axles.—Steel railroad car axles, M. C. B. sizes, free from locomotive axles or defective or imperfect forgings.

Iron Rails.—Standard section T rails, original weight 50 pounds per yard or heavier, minimum length 5 feet, free from frogs, guards, switches, turntable and curved rails.

Steel Rails.—Standard section T rails, suitable for re-rolling, original weight 50 pounds per yard or heavier, minimum length 5 feet, free from split heads, frogs, guards, switches, curved and turntable rails.

A No. 1 Railroad Wrought.—Heavy wrought iron from railroad shops and cars, 6 inches and longer, including iron links and pins.

B No. 2 Wrought.—Heavy wrought iron and soft steel scrap from railroad shops and cars, 2 inches long, 2 inches wide or wider, and longer, including track bolts, nuts and spikes, iron angle bars and plain splices, free from patent joints, steel angles and splices, steel channel bars.

B—X Cut Forge.—Iron and soft steel scrap suitable for piling purposes without further preparation. Material to be ⅜ inch or heavier, 4 inches or narrower and not over 26 inches in length or shorter than 2 inches. May include wagon tire if cut into 6 inch lengths or shorter; also horseshoes if cut into 3 pieces. Must be straight and flat; also free from plate, sheet, hoop and washer scrap, punchings and similar material.

C—Shafting.—Iron and soft steel, 1½ inch to 4 inches round and square, 4 feet and longer, in straight bars.

D—No. 1 Wrought.—Heavy wrought iron and soft steel fagoting scrap, bars ⅜ inch to 4 inches round or square, flats ¼ inch thick and heavier, 4 inches long or longer, including wagon axles, horse shoes and wagon tires, exclusive of other shapes or bent pieces.

E—No. 1 Country Wrought. — Heavy wrought iron and soft steel scrap (the latter not over 0.12 carbon) including buggy tires, horse shoes; all fagoting scrap.

F—No. 1 Mill.—Iron and soft steel bars not less than ⅜ inch round or square, and flats not thinner than No. 12 wire gage, including heavy railroad sheet; tank in separate sheets and rings, boiler sheet and rings, clean pipes and flues, heavy punchings and clippings and strictly soft steel agricultural implement shapes. All steel must be under 0.12 carbon.

G—No. 2 Mill.—Iron and steel hoops and sheets, railroad sheet, cotton tie clippings and ties, skeleton sheet scrap and iron too light for No. 1 mill; scrap shall be free from galvanized, tinned or badly rusted material.

H—No. 1 Busheling.—Iron and soft steel pipes and flues (clean); tank and bands No. 12 and heavier, boiler plate punchings and clippings, and soft steel and iron drop forgings and trimmings; nothing to be over 8 inches long or wide, free from galvanized or tinned stock. All steel must be under 0.12 carbon.

I—No. 2 Busheling.—Cut hoops, sheet, cotton ties and similar light material; nothing to be over 8 inches long or wide; free from dirt, galvanized or tinned material, or other similar inferior scrap.

J—K—Axle Turnings.—Wrought iron and soft steel railroad car axles, turnings and chips. Free from tire turnings.

L—Turnings. — Machine wrought and soft steel, clean and free from borings and drillings, other metals, dirt, lumps and badly tangled material.

M—Drillings.—Wrought or soft steel, clean and free from other metals, dirt and lumps.

N—O—Mixed Borings and Turnings, and Cast Borings.—Clean and free from other metals, dirt and lumps.

P—Pipes and Flues.—Wrought and soft steel. Must be free from dirt or lime and from riveted seams; nothing over 6 inches in diameter.

Q—No. 1 Heavy Melting Steel.—Railroad steel and heavy steel croppings from rails, billets, blooms, structural shapes, plates, bars, rods, channels, angles, plate shearings from steel plates not needle scrap—steel rolls and other similar material. All charging box size not over 6 feet in length or 18 inches wide and not lighter than ¼ inch thick. Minimum weight 10 pounds, maximum 300 pounds.

No agricultural shapes, boiler tubes, grate bars, cast iron, sheet stock or light stock of any description, or curly or unwieldy pieces will be accepted.

All must be clean and free from all dirt and rubbish.

R—Shoveling Steel. — Strictly new heavy clean stock such as railroad track scrap including spikes, bolts, nuts, etc., boiler and bridge punchings and clippings, small crop ends, bolt ends and other similar material. All must be ¼ inch or over in thickness and no light tangled material will be accepted.

S—Bundled Sheet Scrap.—Strictly new side and end clippings and shearings, well bundled, securely wired and not to exceed 125 pounds, to be in charging box size. No stamping scrap will be accepted.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(First half delivery.)

Bessemer, valley	$14.00
Bessemer, Pittsburgh	14.90
Basic, Pittsburgh	13.90
Basic, eastern Pa.	14.00
Malleable, Pittsburgh	14.15
Malleable, Chicago	14.25
Malleable, Philadelphia	15.50 to 15.75
Malleable, Buffalo	13.00 to 13.50
No. 1X Philadelphia	15.25 to 15.50
No. 2 foundry, Pittsburgh	13.90 to 14.40
No. 2 foundry, Cleveland	14.25
No. 2 foundry, Ironton	13.50
No. 2 foundry, Chicago	14.25
No. 2X foundry, Philadelphia	14.75 to 15.00
No. 2X foundry, New York	14.75 to 15.00
No. 2X foundry, Buffalo	13.00 to 13.50
No. 2 plain, Phiiadelphia	14.50 to 14.75
No. 2 plain, New York	14.50 to 14.75
No. 2 plain, Buffalo	13.75
No. 2 southern, Birmingham	10.50 to 11.00
No. 2 southern, Cincinnati	13.75 to 14.25
No. 2 southern, Chicago	14.85 to 15.35
No. 2 southern, Philadelphia	14.75 to 15.00
No. 2 southern, Cleveland	14.85 to 15.35
No. 2 southern, New York	14.75 to 15.25
No. 2 southern, St. Louis	14.50 to 15.00
Virginia, 2X, Philadelphia	15.30 to 15.55
Virginia, 2X, Jersey City	15.60 to 15.85
Virginia 2X, New Eng., all rail	16.20 to 16.70
Gray forge (eastern Pa.)	13.90 to 14.25
Gray forge, Pittsburgh	13.65 to 13.90
Gray forge, Birmingham	9.50 to 10.00
Silveries, 5 per cent, Cleveland	17.30 to 17.55
Silveries, 5 per cent, Birmingham	12.50
Silveries, 5 per cent, Chicago	16.35 to 16.85
Silveries, 8 per cent furnace	15.75 to 16.00
Standard low phos., Phila.	21.00
Lebanon low phos., furnace	17.00 to 17.50
Low phos., Pittsburgh	21.65 to 21.90
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.75 to 16.50
Charcoal, Buffalo	16.00 to 17.00
Charcoal, Birmingham	25.00
Middlesbrough, No. 3, Phila., ex ship	15.00 to 15.25

IRON ORE

(Lower lake ports.)

Old range Bessemer, 55 per cent.	$3.75
Mesabi Bessemer, 55 per cent.	3.50
Old range, non-Bes., 51½ per cent.	3.00
Mesabi, non-Bessemer, 51½ per cent.	2.85

(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent.	7 to 8c
Foreign non-Bess., 50 to 65 per cent.	7 to 8c

COKE

(At the ovens.)

Connellsville furnace	$1.75 to 1.85
Connellsville fur. contr.	2.00
Connellsville foundry	2.40 to 2.65
Connellsville fdy., contr.	2.50 to 2.75
Wise county furnace	1.90 to 2.10
Wise county foundry	2.40 to 3.10
Pocahontas furnace	1.90 to 2.40
Pocahontas foundry	2.40 to 2.50
New River, foundry	2.75 to 3.50
New River, furnace	2.20 to 2.35

FERRO-ALLOYS

Ferro-manganese, Baltimore	$38.00
Ferro-silicon, 50 per cent, Pbgh.	71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent, Pgh.	22.90
Ferro-sil., 11 to 12 per cent. Pgh.	21.90
Ferro-sil., 10 to 11 per cent, Pgh.	20.90
Ferro-sil., 9 to 10 per cent, Pgh.	19.90
Ferro-carbon titanium, carloads, per lb.	8c to 12½c

SEMI-FINISHED STEEL

Bes. billets, Pbgh. and Yn.	$20.00
Open-hearth bl., Pbgh. and Yn.	20.00
Open-hearth bil., Phila.	22.40 to 23.40
Bes. sheet bars, Pbgh. and Yn.	21.00
Op.-h'th sh. bars, Pbgh. & Yn.	21.00
Forging billets, Phila.	26.40 to 27.40
Forging billets, Pittsburgh	25.00
Wire rods, Pittsburgh	26.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh.	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Light rails, 8 lbs., Pbgh. or Chi.	1.40c
Lgt. rails, 12 lbs., Pbgh. or Chgo.	1.35c
Lgt. rails, 16 to 20 lb., Pbgh. or Chicago	1.30c
Lgt. rails, 25 to 45 lbs., Pbgh. or Chicago	1.25c
Relaying rails, standard, Chgo.	23.00 to 24.00
Relaying rails, light, Chicago	$21.50 to 22.50
Angle bars, st. sect. Pbgh., base	1.50c
Angle bars, st., sections, Chgo.	1.50c
Spikes, railroad, Pbgh.	1.40c to 1.45c
Spikes, railroad, Chgo.	1.55c
Track bolts, Pbgh.	2.00c
Track bolts, Chgo.	2.00c

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.15c
Structural shapes, Chicago	1.28c to 1.33c
Structural shapes, Philadelphia	1.25c to 1.30c
Structural shapes, New York	1.26c to 1.31c
Structural shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.28c to 1.33c
Tank plates, Pittsburgh	1.10c to 1.15c
Tank plates, Philadelphia	1.25c to 1.30c
Tank plates, New York	1.26c to 1.31c
Bars, soft steel, Pittsburgh	1.15c
Bars, soft steel, Chicago	1.28c to 1.33c
Bars, soft steel, Philadelphia	1.30c to 1.35c
Bars, soft steel, New York	1.31c to 1.36c
Hoops, carloads, Pittsburgh	1.25c to 1.30c

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 pounds, to:—

New York	16 cents
Philadelphia	15 cents
Boston	18 cents
Buffalo	11 cents
Baltimore	14½ cents
Cleveland	10 cents
Cincinnati	15 cents
Chicago	18 cents
Minneapolis and St. Paul	32 cents
Denver	67½ cents
St. Louis	22½ cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast, plates and shapes	80 cents

Hoops, less carloads, Pittsburgh	1.35c
Bands, Pittsburgh	1.15c to 1.20c
Shafting, carloads, Pbgh., disc.	65 to 66
Shaft'g less carl'ds, Pbgh., disc.	62 to 63
Bar iron, Chicago	1.10c to 1.12½c
Bar iron, Philadelphia	1.20c to 1.25c
Bar iron, New York	1.25c to 1.30c
Bar iron, Cleveland	1.20c to 1.25c
Bar iron, Pittsburgh	1.30c
Hard steel bars, Chicago	1.25c to 1.30c
Smooth finish'g mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.85c to 1.90c
No. 28 black, Chicago	1.98c to 2.03c
No. 28, tin mill, black, Pbgh.	1.85c
No. 28, galvanized, Pbgh.	2.80c to 2.85c
No. 28, galvanized, Chgo.	2.98c to 3.03c
No. 28, cor. galv., Pbgh.	3.00c to 3.10c
No. 28, painted cor., Pbgh.	2.10c to 2.20c
No. 10, blue annealed, Pbgh.	1.35c to 1.40c
No. 10, blue annealed, Phila.	1.55c to 1.60c
Tin plate, 100 lb., coke, base	$3.30 to 3.40

IRON AND STEEL PIPE

(Pittsburgh.)

	Black Butt-weld.	Galv.
Steel, ⅜ to 3 inches	80	71½
Iron, ⅜ to 2½ inches	70	61
	Lap-weld.	
Steel, 2½ to 6 inches	79	70½

BOILER TUBES

Steel, 3½ to 4½ inches	72
Iron, 3½ to 4½ inches	60

WIRE PRODUCTS

Wire nails, jobbers, Pittsburgh	$1.55
Wire nails, retailers, Pittsburgh	1.60
Plain wire, jobbers, Pittsburgh	1.35
Plain wire, retailers, Pittsburgh	1.40
Galvanized wire, jobbers, Pbgh.	1.75
Galvanized wire, retailers, Pbgh.	1.80
Polished staples, Pbgh.	1.55
Galvanized staples, Pbgh.	1.95
Barb wire, painted, jobbers, Pbgh.	1.55
Barb wire, painted, retail'rs, Pbgh.	1.60
Barb wire, galv., retailers, Pbgh.	2.00
Barb wire, galv., jobbers, Pbgh.	1.95

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled threads, 80 and 10; cut threads, 80 and 5; larger or longer, 75 and 10.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter, rolled, 80 and 15; cut, 80 and 10; larger or longer, 75 and 15.

Gimlet and cone point lag or coach screws, 80 and 20.

Hot pressed square, blank or tapped nuts, $6.30 off list; hot pressed hexagon blank or tapped, $7.20 off.

Cold pressed, C. & T. square, blank or tapped, $6 off; hexagon, blank or tapped, ⅝ inch and larger, $7.20; ½-inch and smaller, $7.80.

RIVETS

Structural rivets, Pbgh.	1.60c to 1.65c
Structural rivets, Chgo.	1.73c to 1.78c
Boiler rivets, Pbgh.	1.70c to 1.75c
Boiler rivets, Chgo.	1.83c to 1.88c

SCREWS

(New York.)

Lag, gimlet and cone point	80 and 20
Coach, gimlet point	80
Standard jack	70 and 10
Mch., cut thread, flat head	50 and 10
Mach., cut thread, round head	50 and 10 and 10
Mch., cut thread, fillister hd.	40 and 40 and 10
Mch., rolled thread, flat head or round head	80 and 10
Set screws, iron	75 and 10 and 10
Set screws, steel, per cent advance over iron	25
Square head cap screws	70 and 10 and 10
Hexagon head cap screws	70 and 10 and 10
Fillister head cap screws	60 and 10 and 10
Flat head wood screws	10 and 10 and 5
Round head wood screws	10 and 10 and 5

WASHERS

(Discounts, Iron or Steel, to Jobbers, Cleveland.)

⅛-inch	$7.25
3/16-inch	7.00
¼-inch	7.00
5/16-inch	7.00
⅜-inch	7.00

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	1.55c to 1.60c

TWISTED REINFORCING BARS

(Soft steel, Pittsburgh mill.)

¼-inch and larger	1.25c
5/16-inch	1.30c
⅜-inch	1.35c
7/16-inch	1.50c
½-inch	1.75c

IRON AND STEEL PRICES

Corrected up to Tuesday noon

TACKS

(New York.)

	Discount.
American carpet tacks.....	90 and 20 and 10
American cut tacks.....	90 and 20 and 10
Railroad tacks	90 and 40
Gimp tacks	90 and 20 and 10
Finishing nails	70

WIRE ROPE

Galvanized, iron and steel.....	47½ and 2½
Bright, iron and steel.....	55 and 2½

TRIANGLE REINFORCING MESH

(Per 100 square feet f. o. b. mill, car loads.)

No. 4, plain	$1.00
No. 4, galvanized	1.12
No. 7, plain	.49
No. 7, galvanized	.55
No. 23, plain	1.69
No. 23, galvanized	1.88
No. 26, plain	1.17
No. 26, galvanized	1.30
No. 27, plain	.96
No. 27, galvanized	1.07
No. 31, plain	2.49
No. 31, galvanized	2.76
No. 35, plain	1.17c
No. 35, galvanized	1.30
No. 39, plain	3.05
No. 39, galvanized	3.38
No. 43, plain	1.10
No. 43, galvanized	1.23

SPIRAL RIVETED PIPE

(Per 100 linear feet, f. o. b. factory.)

4-inch, plain	$ 19.76
4-inch, galvanized	30.74
6-inch, plain	33.05
6-inch, galvanized	49.73
8-inch, plain	43.17
8-inch, galvanized	65.00
10-inch, plain	66.42
10-inch, galvanized	96.15
12-inch, plain	83.75
12-inch, galvanized	118.30
14-inch, plain	99.14
14-inch, galvanized	138.85
16-inch, plain	117.53
16-inch, galvanized	166.58
20-inch, plain	183.79
20-inch, galvanized	248.39
24-inch, plain	219.92
24-inch, galvanized	293.99
30-inch, plain	324.81
30-inch, galvanized	430.64

CAST IRON PIPE

Three to 24 in., Cleveland.....	$22.35 to 22.80
Four-inch, water, Chicago.....	26.50
Six to 12 inches, Chicago.....	24.50
Larger sizes, Chicago.....	24.00
Six inch, water, New York....	21.00 to 22.00
Four-inch, water, Birmingham..	21.50
Six inch and larger, Birmingham	19.50

Gas pipe, $1 per ton higher than water.

WAREHOUSE PRICES

Steel bars, Chicago.....	1.65c
Steel bars, Cleveland.....	1.80c
Steel bars, Cincinnati.....	1.70c to 1.85c
Steel bars, Philadelphia.....	1.65c to 1.70c
Steel bars, New York.....	1.80c
Iron bars, Chicago.....	1.65c
Iron bars, Cleveland.....	1.75c
Iron bars, Cincinnati.....	1.65c to 1.75c
Iron bars, Philadelphia.....	1.60c to 1.65c
Iron bars, New York.....	1.65c to 1.70c
Hoops, Chicago	2.15c
Shapes and plates, Chicago.....	1.75c
Shapes and plates, Cleveland....	1.90c
Shapes and plates, Cincinnati...	1.80c to 1.90c
Shapes and plates, Philadelphia.	1.65c to 1.70c
Shapes and plates, New York..	1.85c
No. 10 blue ann. sheets, Chgo..	1.95c
No. 10 blue ann. sheets, Cleve.	2.15c
No. 10 blue ann. sheets, Cincl..	1.95c to 2.05c
No. 28 black sheets, Chgo.....	2.45c
No. 28 black sheets, Cleveland.	2.60c
No. 28 black sheets, Cincinnati.	2.45c to 2.55c
No. 28 galv. sheets, Chgo.....	3.45c
No. 28 galv. sheets, Cleveland..	3.60c
No. 28 galv. sheets, Cincinnati..	3.45c to 3.55c

IRON AND STEEL SCRAP

(Net tons.)

No. 1 railroad wrought, Chgo..	$ 8.75 to 9.00
No. 1 railroad wrought, Cleve..	9.50 to 10.00
No. 1 railroad wrought, St. L.	7.75 to 8.00
No. 1 railroad wrought, Cinci..	8.00 to 8.50
No. 2 railroad wrought, Chgo..	8.25 to 8.50
No. 2 railroad wrought, St. L..	7.50 to 7.75
Arch bars and transoms, Chgo..	12.00 to 12.50
Arch bars and transoms, St. L.	11.00 to 11.50
Knuckles, coup. and spr'gs, Chgo.	9.00 to 9.50
Knuckles, coup., and sp'gs, St. L.	9.00 to 9.25
Shafting, Chicago	11.50 to 12.00
Shafting, St. Louis.....	13.00 to 13.50
Steel car axles, Chgo.....	12.25 to 12.50
Steel car axles, St. Louis.....	11.50 to 11.75
Locomotive tires, Chicago.....	9.75 to 10.00
Locomotive tires, St. Louis.....	9.00 to 9.50
Cut forge, Chicago.....	8.25 to 8.50
Pipes and flues, Chicago.....	6.50 to 7.00
Pipes and flues, Cleveland.....	8.00 to 8.50
Pipes and flues, St. Louis.....	6.50 to 7.00
No. 1 cast, Chicago.....	9.75 to 10.25
No. 1 cast, Cleveland.....	10.75 to 11.00

Freight Rates, Coke

Connellsville regions, per 2,000 lbs., to:—

Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis.....	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.70
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley furnaces	1.20
Cincinnati	2.00

No. 1 cast, Cincinnati.....	9.25 to 9.75
No. 1 cast, St. Louis.....	10.00 to 10.50
No. 1 busheling, Chicago.....	7.25 to 7.75
No. 1 busheling, Cleveland.....	8.50 to 9.00
No. 1 busheling, Cincinnati....	6.00 to 6.50
No. 1 busheling, St. Louis.....	7.50 to 8.00
No. 2 busheling, Chicago.....	6.00 to 6.25
No. 1 boiler plate, cut, Chgo...	6.50 to 7.00
No. 1 boiler plate, cut, Buffalo..	9.00 to 9.50
No. 1 boiler plate, cut. St. L..	6.00 to 6.50
Boiler punchings, Chicago.....	9.00 to 9.25
Cast borings, Chicago.....	4.75 to 5.25
Cast borings, Cleveland.....	6.00 to 6.25
Cast borings, Cincinnati.....	4.25 to 4.75
Cast borings, St. Louis.....	4.00 to 4.50
Machine shop turnings, Chgo..	5.25 to 5.50
Machine shop turnings, Cleve..	5.50 to 5.75
Machine shop turnings, Cinci...	4.50 to 5.00
Machine shop turnings, St. L...	4.50 to 5.00
Angle bars, iron, Chgo.....	8.25 to 8.75
Malleable, agricultural, Chgo...	8.25 to 8.75
Malleable, agricultural, St. Louis	7.25 to 7.50
Malleable, railroad, Chicago....	9.25 to 9.75
Malleable, railroad, Cincinnati..	6.50 to 7.00
Malleable, railroad, St. Louis..	8.00 to 8.25
Angle bars, iron, Chgo.....	11.75 to 12.25
Angle bars, iron, St. Louis.....	10.00 to 10.50
Angle bars, steel, Chgo.....	8.25 to 8.75
Angle bars, steel, St. Louis....	9.00 to 9.50
Stove plate, Chicago.....	9.25 to 9.75
Stove plate, Cleveland.....	8.25 to 8.75
Stove plate, Buffalo.....	9.75 to 10.00
Stove plate, Cincinnati.....	7.00 to 7.50
Stove plate, St. Louis.....	7.50 to 8.00
Bundled sheet, Cincinnati.....	4.75 to 5.25
Wrought iron pil'g plates, Clev.	13.00

(Gross Tons.)

Heavy melting steel, Pbgh.....	$12.00
Heavy melting steel, Buffalo....	10.00 to 10.50
Heavy melting steel, Chicago..	9.75 to 10.00
Heavy melting steel, Cleveland.	10.00 to 10.50
Heavy melting steel, Cincinnati.	9.00 to 9.50
H'vy melting steel, eastern Pa..	10.75 to 11.00
Heavy melting steel, New York	8.50 to 8.75
Heavy melting steel, St. Louis.	11.00 to 11.50
Bundled sheet, Buffalo.....	6.25 to 6.50
Grate bars, Buffalo.....	9.50 to 10.00
Grate bars, New York.....	6.00 to 6.25
No. 1 railroad wr'ght, east. Pa.	12.50 to 12.75
No. 1 railroad wrought, Pbgh.	11.00 to 11.50
No. 1 R. R. wght., New York.	10.25 to 10.50
No. 1 R. R. wrought, Buffalo..	11.00 to 11.50
Shafting, New York.....	12.00 to 12.50
Pipes and flues, New York.....	8.00 to 8.25
Pipes and flues, eastern Pa....	9.50 to 10.00
Mch. shop turnings, New York	5.50 to 5.75
Machine shop turnings, Buffalo.	5.50 to 6.00
Mch. shop turnings, Pbgh.....	7.75 to 8.00
Mch. shop turnings, eastern Pa.	7.50 to 8.00
Cast borings, New York.....	5.50 to 5.75
Cast borings, eastern Pa.....	8.00 to 8.50
Cast borings, Buffalo.....	6.00 to 6.50
Cast borings, Pittsburgh.....	7.75 to 8.00
Stove plate, (Jersey points)....	8.75 to 9.00
Stove plate, Pittsburgh.....	10.00 to 10.25
Stove plate, eastern Pa.....	8.50 to 9.00
Shoveling steel, Chicago.....	9.25 to 9.50
Shoveling steel, St. Louis.....	9.00 to 9.50
Reroll'g rails, 5 ft. & ov., Pbgh.	13.00 to 13.25
Reroll. rails, 5 ft. and ov., Chgo.	11.25 to 11.75
Reroll. rails, 5 ft. and ov., Cleve.	11.75 to 12.25
Reroll. rails, 5 ft. & ov., E. Pa.	12.00 to 12.50
Reroll. rails, 5 ft. and ov., St. L.	12.00 to 12.50
Steel rails, short, Chicago.....	10.50 to 10.75
Steel rails, short, Cleveland....	13.00 to 13.25
Steel rails, short, St. Louis.....	11.50 to 12.00
Iron rails, Cleveland.....	13.50 to 14.00
Iron rails, Cincinnati.....	10.50 to 11.00
Iron rails, eastern Pa.....	15.00 to 16.00
Iron rails, St. Louis.....	12.00 to 12.25
Frogs, switches, guards, Chgo..	9.50 to 9.75
Frogs, switches and g'rds, St. L.	10.25 to 10.50
Car wheels, (iron), Pittsburgh..	11.25 to 11.50
Car wheels, (steel), Pittsburgh.	12.25 to 12.50
Car wheels, Chicago.....	11.25 to 11.50
Car wheels, eastern Pa.....	11.50 to 11.75
Car wheels, Buffalo.....	12.00 to 12.50
Car wheels, N. J. points.....	11.50 to 12.00
Car wheels, St. Louis.....	11.00 to 11.25
Iron axles, Pittsburgh.....	22.50 to 23.00
Iron axles, Cincinnati.....	19.00 to 20.00
Iron axles, eastern Pa.....	20.00 to 21.00
Iron axles, Buffalo.....	21.50 to 22.00
Iron axles, Chicago.....	19.00 to 19.50
Steel car axles, New York.....	12.25 to 12.75
Steel car axles, Buffalo.....	15.00 to 15.50
Steel car axles, Cleveland.....	15.00 to 16.00
Steel car axles, eastern Pa.....	14.00 to 14.50
No. 1 busheling, Buffalo.....	8.50 to 9.00
No. 1 busheling, Pittsburgh....	10.00 to 10.25
No. 2 busheling, Buffalo.....	6.00 to 6.50
Low phosphorus steel, Buffalo..	15.00 to 15.50
Low phosphorus steel, Pbgh...	14.25 to 14.50
Low phos. steel, eastern Pa.....	14.50 to 15.00
No. 1 forge, eastern Pa.....	8.00 to 8.50
No. 1 cast eastern Pa.....	12.00 to 12.50
No. 1 cast, Pittsburgh.....	12.00 to 12.25
No. 1 cast (N. J. points).....	11.75 to 12.00
Boiler plate, Cleveland.....	8.50 to 9.00
Mall. iron, agricul., Cleveland...	9.00 to 9.50
Mall. iron R. R., Cleveland...	10.50
Malleable, railroad, Pittsburgh..	10.00 to 10.25
Malleable R. R. Buffalo.....	10.75 to 11.25
Mal., R. R. east. Pa.....	9.00 to 9.50
Bundled sheet, Pittsburgh.....	8.50 to 8.75
Bundled sheet, Cleveland.....	7.50 to 8.00

MISCELLANEOUS SHOP TOOLS

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Standard files	80 and 5
Heavy hammers, 3 to 5 lb.....	80 and 10
Heavy hammers, over 5 lb.....	80 and 5
Gas pliers, 7-inch, per dozen.....	$2.00
Gas pliers, 12-inch, per dozen.....	3.50
Cold chisels, per pound.....	15c to 15c
Wrenches, Alligator, discount.....	75 and 80
Wrenches, drop forged S.....	50 and 10

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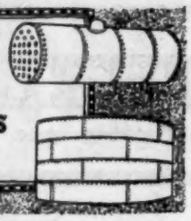

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How Heat Treating Affects Wire

(*Continued from page 962*)

and the methods adopted for its solution. Thus, we have found it possible to overcome prejudice which the practical man often has for "theory", and have established in its place a spirit of eagerness for better practice. The results already obtained warrant us in feeling that there is ahead of us abundant opportunity for making steel of even greater value in the service of mankind.

Recent Coke Oven Developments

(*Continued from page 977*)

ally differs materially from the latest type of vertical flue oven now in successful operation in the United States. The oven described by Mr. Blauvelt represents the successive and progressive steps made by the Semet-Solvay Co. in strength, simplicity and effort for uniform temperature.

Much has been said in favor of simplicity of recuperation as against regeneration for the combustion of the gas in the flues, also of continuous heating versus reversing; but all told, all modern types have finally found it to be more economical and efficient to use regeneration in place of recuperation, except in certain isolated cases, as pointed out by Mr. Blauvelt. Unless great care is taken in design, it is almost impossible to prevent short-circuiting or leakage of gas and air in recuperative chambers or flues and this is not only wasteful, but impairs, to a certain extent, the efficiency and the control of combustion.

The strength of construction in this latest type of Semet-Solvay oven is a noteworthy feature of great importance, for strength of oven and flue walls is imperative in our modern coke oven practice of fast driving necessitated by short coking time. The simplicity of control of gas and air and the ready supervision of the combustion in the flues by means of peep-holes are factors that will appeal to all coke oven operators.

As to coking time, I regret we have no definite data from Mr. Blauvelt, for this is a point of great importance to us. We have found, as a rule, that the shorter coking time gives the best blast-furnace coke and that there must be no delay in pushing the coke out of the oven after it is coked. What the actual length of coking time for various coals alone or in mixture is, has to be determined by actual trial; so far we find that there is no great difference in coking time in the type of oven with which I am most familiar, whether we use high or low volatile coals. It may be found advisable to increase the coking time somewhat when using all high volatile coals, but the difference between this and low volatile mixtures does not, in our present experience, exceed, say, two hours on the average.

In view of its ability to obtain high and uniform coking temperatures, I can see no reason why the new Semet-Solvay coke oven should not be able to make coke in practically the same time as that of any other system. All in all, this latest development is of keen interest to us, as it is the purpose of the company with which I am connected, the United States Steel Corporation, to adopt always the latest and most approved type of by-product coke oven, being in no sense whatever tied down to any one system by preference, prejudice or any other reason.

The production of chromic iron ore in the eastern portion of the United States, where the demand is greatest, ceased years ago. The supply is now obtained wholly by importation, mainly from South Africa. On the other

hand, the Pacific coast supplies all its own demands by home production. Possibly with the completion of the Panama canal the California product will also invade eastern markets. Copies of the report on chromic iron ore may be obtained free on application to the Director of the Geological Survey, Washington, D. C.

Output of Chrome Iron Ore

Many years ago the chromic iron ore industry centered in the Atlantic coast states, especially Maryland and Pennsylvania, where much of this ore was used in the manufacture of chemicals; but in later years the only chrome ore produced in the United States has come from the Pacific coast. According to J. S. Diller, of the United States Geological Survey, in a report on the production of chromic iron ore in 1913, California has been the only producing state for nearly a decade. The marketed product in 1912 was 201 long tons, valued at $2,753, a gain of nearly 70 per cent over the production of 1911, but in 1913 the sales amounted to 255 long tons, valued at $2,854, a gain of nearly 27 per cent in quantity compared with the output of 1912. Practically the whole output in 1913 came from one mine near Dunsmuir, in Shasta county.

Chromite is one of the most difficult minerals to fuse. It will stand a temperature of about 2,180 degrees Cent., and this marked resistance to heat makes it valuable for refractory purposes, furnace hearths, chrome bricks for lining furnaces, etc. A large amount is consumed in the manufacture of pigments, dyes, and various chemical compounds, as well as for tanning, in which it imparts to the leather softness and durability under exposure to dampness.

The most rapidly growing use of chromite is metallurgical, in the manufacture of steel alloys. Chromium gives to steel a marked degree of hardness and if added in the proper proportion does not produce brittleness. Chromium steel alone or alloyed with tungsten or molybdenum is used for making high-speed tools. It is also used for armor plates and armor-piercing projectiles, and for these purposes it is generally alloyed with nickel, vanadium, or manganese.

Large Chromic Iron Ore Deposits in California

Deposits of chromic iron ore occur in Maryland and the adjacent portion of Pennsylvania, in North Carolina, and in Wyoming, but the only deposits operated in the United States within recent years are in California. Numerous deposits have been reported in 32 counties of that state, according to the United States Geological Survey, and many of them could be worked if the demand for the ore and its value warranted exploitation. The available deposits, with much in reserve, largely exceed the local demand for refractory material in a field extending as far east as the Rocky mountains.

Withstands Great Heat

It has been found by experiment that when the impure forms of bauxite containing considerable iron oxide are exposed to intense heat the bauxite is converted into a solid mass of emery which is so hard that it can barely be cut by steel tools and resists chemical, thermal and mechanical action to a marked degree. Recent applications of bauxite in brick according to the United States Geological Survey are in the lining of rotary cement kilns, lead-refining furnaces, and basic open-hearth steel furnaces.

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WORKS ON NORTH SIDE

Opportunities

Men Wanted
Minimum, 50 words, $1.00. Each additional word, 2c. All capitals, 50 words, $1.50. Each additional word, 3c.

Position Wanted
Minimum, 25 words, 50c. Each additional word, 2c. All capitals, 25 words, 75c. Each additional word, 3c.

Miscellaneous Classified
Minimum, 25 words, $1.00. Each additional word, 4c. All capitals, 25 words, $2.00. Each additional word, 8c.

Men Wanted

WANTED — EXPERIENCED CHEMIST to take charge of laboratory in steel works, Cleveland district. In answering, give age, references, qualifications and name salary expected. Address Box 165, THE IRON TRADE REVIEW, Cleveland, O.

WANTED BY COMPANY OPERATING two merchant blast furnaces, master mechanic of wide blast furnace experience especially as to steam. State age, experience, references, salary desired and when prepared to make engagement. Address Box 144, THE IRON TRADE REVIEW, Cleveland, O.

THE BEST WAY TO GET A GOOD POsition in drafting or engineering is to file an application direct with some of our clients who are depending on us to get competent and experienced applicants for their vacant positions. Send stamp for blank and list of vacant positions. The Cleveland Engineering Agency Co., Rose building, Cleveland, O.

WANTED—A COMPETENT INSTRUCTor in a large malleable shop to break in green help on light work and to increase production of present molders. Must be good molder himself and entirely familiar with molding machines, match plates, etc. State age, references, wages expected. Address Box 153, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

COST VS. EFFICIENCY. — COLLEGE graduate, experienced cost accountant, with executive ability to correct and maintain labor efficiency, to plan production, to organize. Address Box 134, THE IRON TRADE REVIEW, Cleveland, O.

AS FOREMAN OF PATTERN SHOP. Over 12 years as foreman employing from 20 to 100 men. Broad experience with molding machines, gas and oil engines, electrical machinery and dies. Address Box 987, THE IRON TRADE REVIEW, Cleveland, O.

A TRAINED BUSINESS MAN OF 35 with ability to analyze, decide, plan, delegate and act; experienced in finance, costs, credits, accounts, sales purchases, in fact all branches of manufacturing business, wishes, for excellent reasons, to make a change. At present general manager of a corporation, before that secretary and treasurer. Good record, gilt edged references. Address Box 147, THE IRON TRADE REVIEW, Cleveland.

BLAST FURNACEMAN.—AT PRESENT engaged as assistant superintendent on large furnaces desires position as superintendent. Correspondence invited. Address Box 164, THE IRON TRADE REVIEW, Cleveland.

POSITION — AS SUPERINTENDENT malleable, up-to-date in all branches; can give best of references; at present employed, can give good reasons for desiring change. Address Box 996, THE IRON TRADE REVIEW, Cleveland, O.

DO NOT ANSWER THIS AD UNLESS you are looking for an expert foundry superintendent or manager; one who has 23 years of experience on loam, dry and green sand, in brass, bronze, steel and iron with some of the largest concerns in the country; graduate in metallurgy and mix by analysis; expert on molding machines and match plates; estimating; wood and metal pattern-making. Technical as well as practical qualifications; can guarantee all classes of cylinders made by my process will stand the most severe test and will not leak; married; 37 years of age; have spent five years as chief foundry engineer and adviser in United States navy yard; can furnish best of references; understand all classes of work. Address Box 174, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — POSITION AS FOUNDRY superintendent; competent to take charge of pattern shop; also familiar with every detail connected with the successful operation of a foundry regardless of size; good executive, at present holding responsible position; A-1 references. Address Box 146, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED AS PURCHASING agent or traffic manager by young man thoroughly experienced and well qualified; mechanical engineer; systemization specialist; a good record and best of references. Address Box 168, THE IRON TRADE REVIEW, Cleveland, O.

GRADUATE CHEMIST AND METALlurgist; practical experience in laboratory and in operation of cupolas and open hearth furnaces; consultant on special mixtures in iron and steel. Address Box 175, THE IRON TRADE REVIEW, Cleveland, O.

WANTED—POSITION BY OFFICE MAN, 30, who has held positions of trust and initiative, such as paymaster of mine, clerk on road for construction companies, etc. Opportunity is of greater importance than initial salary. Address Box 176, THE IRON TRADE REVIEW, Cleveland, O.

MILLWRIGHT, FIRST CLASS, LARGE experience; also carpentering, rope and belt splicing, concreting; aged 35, hustler; can give reference. Cleveland firm preferred. Address 1529 Addison Road, Cleveland, O.

EXECUTIVE, MANAGER, WORKS MANAGER AND SALES ENGINEER, TWENTY YEARS EXPERIENCE IN STEEL MILL, FOUNDRY, MACHINE, FORGINGS AND PRESS WORK. Thorough technical, shop designing, office, commercial and financial training combined. Successful record, several large plants, reorganizing personnel and modernizing product, equipment, methods and financial conditions. Have changed run-down plant and LOSSES to modern equipment and PROFIT with minimum expenditure. Would consider small proposition if opportunity afforded acquiring substantial interest. Business must be financially sound. Address Box 179, THE IRON TRADE REVIEW, Cleveland.

Sales Agents

WANTED—AN ENERGETIC FIRM OF high standing with effective Selling Organization in the States wanted as agents for the introduction and sale of a first class high speed steel; also of high grade tool, constructional and special steels for the Motor Car and Aeroplane Motor Industry, in ingots, billets and bars. Agents also wanted for Canada. Applications with full details and references to the Norwegian Consulate General, New York.

Salesmen

SALESMAN WANTED:—EXCEPTIONAL opportunity for technical graduate in electrical engineering, 22 to 25 years old, with large manufacture of electrical apparatus; state your training, experience, qualifications and whether you are at present employed, also compensation expected. Address Box 178, THE IRON TRADE REVIEW, Cleveland, O.

For Sale

WILL SELL OR RENT MODERN MANufacturing plant, located on Big Four R. R. and West 70th St; 15,000 square feet floor space; 40,000 square feet land. J. DeKaiser, 1015 Williamson Bldg., Cleveland, O.

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SAYRE IRON WORKS FOR RENT. In complete running order. Cupola, traveling and stationary cranes, flasks, concrete foundry building 78 x 200 feet; pattern shed, machine shop, office building all separate. **Water transportation from Old Point, and lo**cated directly on Chesapeake & Ohio railroad. Good business. Now renting for $225 a month. Apply Jas. M. Cumming, Phoebus, Va.

Opportunities

WILL BUY PATENTS, OR BUILD AND market metal specialties on royalty. Articles made from perforated metal preferred. Address Box 173, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — TO INTEREST PARTY with factory to take on the manufacture and sale of good "live line" medium heavy machinery; no experiment; have patterns, templets, jigs, cuts, etc.; can show machines in operation and give practical assistance in securing trade, etc. Address Box 177, THE IRON TRADE REVIEW, Cleveland, O.

Miscellaneous

MANUFACTURING IN CANADA.

American Manufacturers, contemplating the establishment of a factory in Canada, will save time by consulting us. We have complete detailed information on every commercial city; shipping facilities, power rates, raw materials, labor conditions, details of vacant factories, inducements, etc. Dept. K, Heaton's Industrial Agency, Toronto.